

# MINING WORLD



MARCH 1961



**BERYLLIUM** ore specimens including rare bertrandite as mined by U. S. Beryllium Corporation. For full details see ▶ 28  
Marinduque—Copper ore to sheet without smelting or electrolysis ▶ 31  
How Kerr-McGee drilled 90-inch diameter Ambrosia Lake air shaft ▶ 34



**new**

## JR-300 JACKDRILL

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**50% Higher Drilling Speed  
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Maximum Production at  
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Never before in the history of rock drilling has there been a feed-leg drill that could do so much, so easily, as Ingersoll-Rand's new JR-300 Universal Jackdrill. On performance alone, it is 40 to 60% faster than preceding models.

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*for lower drilling cost ...*



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Coromant**

*SR-Treated Integral Steels!*

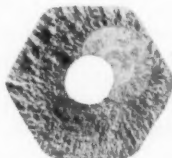
- Corrosion promotes breakage: You know, of course, the variety of mechanical stresses to which steels are subjected in work. Stresses cause fatigue; can cause premature rod breakage, before the normal tensile strength or even the yield point has been exceeded.

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Sandvik Coromant Integral Steels are available from 1" to 1 3/4" bit diameter, in 3/4", 7/8", and 1" hexagonal steel section.

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Appearance of a fatigue breakage that often arises with rods that have not been protected against corrosion. Sandvik's SR-treatment\* protects against such failures.

\*pat. pend.



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1960

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## “Our new 944 Traxcavator loads and levels nine 18-yd. trucks an hour

It gets its bucket full easier than other machines, is faster and handles better. Has plenty of reach for big trucks, too.”

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Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

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### Here's how the 922, 944 and 966 are built to do a better job for you.

**CAT DIESEL ENGINES**—Turbocharged for efficiency and quick acceleration. Optional gasoline engines for the 922 and 944.

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**LONG REACH**—With the lift arms up front, the reach at dumping height of the new Traxcavators is impressive: 57" on the 966, 51" on the 944 and 41" on the 922.

**OPERATOR CONVENIENCES**—Bucket controls have automatic positioners to speed every cycle; machine controls are all power boosted for easy operation. Dual brakes give operator choice of braking with or without transmission engaged.

**FULL LINE OF ATTACHMENTS**—Special material buckets, side dump buckets, forks, cabs, etc.



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MILLER FREEMAN PUBLICATIONS



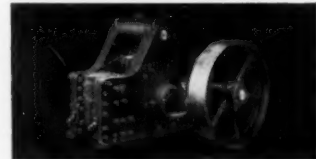
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## NO MAJOR REPAIRS IN 25 YEARS\*

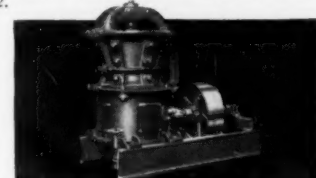
**Sturtevant Construction Assures  
Long Mill Life at Top Loads**

Sturtevant crushing and grinding machinery answers the long life top-load production problem for medium to small size plants. Many Sturtevants have been operating above rated capacities for more than 25 years, and *without a major repair*.

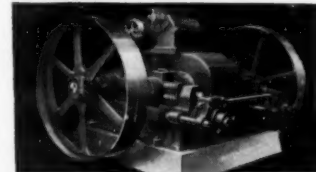
"Open-Door" design gives instant accessibility where needed—makes cleanouts, inspection and maintenance fast and easy. Machines may be set up in units to operate at equal quality and capacity.



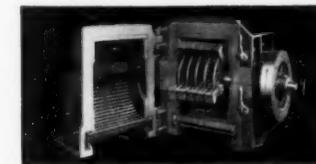
**Jaw Crushers**—Produce coarse (5 in. largest model) to fine (¼ in. smallest model). Eight models range from 2 x 6 in. jaw opening (lab model) to 12 x 26 in. Capacities to 30 tph. All except two smallest sizes operate on double cam principle—crush double per energy unit. Request Bulletin No. 062.



**Rotary Fine Crusher**—Reduce soft to medium hard 3 to 8 in. material down to ¼ to 1¼ in. sizes. Capacities up to 30 tph. Smallest model has 6 x 18 in. hopper opening; largest, 10 x 30 in. Non-clogging operation. Single handwheel regulates size. Request Bulletin No. 063.



**Crushing Rolls**—Reduce soft to hard 2 in. and smaller materials to from 12 to 20 mesh with minimum fines. Eight sizes, with rolls from 8 x 5 in. to 38 x 20 in.; rates to 87 tph. Three types—Balanced Rolls; Plain Balanced Rolls; Laboratory Rolls—all may be adjusted in operation. Request Bulletin No. 065.



**Hammer Mills**—Reduce to 20 mesh. Swing-Sledge Mills crush or shred medium hard material up to 70 tph. Hinged-Hammer Pulverizers crush or shred softer material at rates up to 30 tph. Four Swing-Sledge Mills with feed openings from 6 x 5 in. to 20 x 30½ in. Four Hinged-Hammer Pulverizers with feed openings from 12 x 12 in. to 12½ x 24 in. Request Bulletin No. 084.

\*Reports Manager W. Carleton Merrill concerning Sturtevant Swing-Sledge Mill at James F. Morse Co., Boston.

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**NOW! A dump car that saves hundreds of hours a month in unloading time and stops materials loss in transit.**

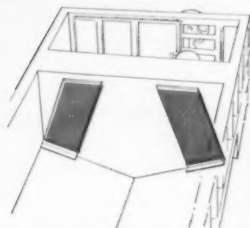


Designed to dump straight down into a receiving bin or hopper, B-L-H's new and highly efficient bottom dump gondola virtually does away with the two bugaboos that have long plagued copper-concentrate producers and other processors of ore and chemicals—time-consuming unloading operations; and ore losses in transit.

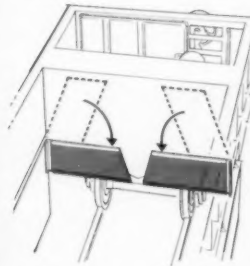
**Note these major features of the car:**

- Sides slope slightly outward at the bottom, to overcome any tendency of the materials to stick to the walls
- Special low-adherence paint further counteracts sticking
- Steel blade device extends up into body of car, acts as scraper along endplates; blade device is optional—need for it depending on characteristics of material to be dumped
- One movement of a single lever dumps payload clean and fast
- Rubber seals fastened to inside of door plates and running along three sides of each door prevent liquids from leaking out

B-L-H's new ore-carrying dump car can be built to your individual specifications in any capacity you require. For complete details, write requesting Bulletin 3001.



In dumping, as doors swing down and out, knife blades welded to doors cleave mineral deposits from ends of car in one fast, clean sweep.



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# Education of a Manager

The College of Mines, University of Idaho, at Moscow has just published the results of a survey made last year by mailing questionnaires on mining engineering enrollment to 113 industry executives.

Professors Joseph Newton and Jerry M. Whiting hope that survey answers compiled into "Comments of a Survey of the Mining Industry on Mining Engineering as a Profession" will in some small measure stimulate further interest in clarifying the future of the mining engineering profession.

MINING WORLD takes this opportunity to summarize the findings for widest possible industry study and action. The University of Idaho proposes to act as follows: Explain to students that they must not feel they are "pure engineers" and that they must move into management positions to advance—that necessitates learning about labor relations, economics, history, business, and related subjects. No major changes will be made in the current undergraduate curriculum. A fifth year of study is proposed, leading to the degree of Master of Mineral Industry Management. The student would have opportunity for training in economics, labor relations, etc.

Only students with a B.S. degree, at least five years of engineering and or management experience in the mineral industry, and evidence to show that they have what it takes to become managers will be admitted to the new course.

This proposal follows recommendations from a number of returned questionnaires which specifically advised that for an engineer to become a manager, he needed additional training beyond his engineering degree with courses in industrial psychology, applied statistics, cost accounting, production planning, cost analysis, time study, mine management, and business methods.

Company presidents, managers, and officers consider that undergraduate training is still wanting in that it fails to produce young engineers who can write clear reports, use correct grammar, and know how to spell and write as well as speak.

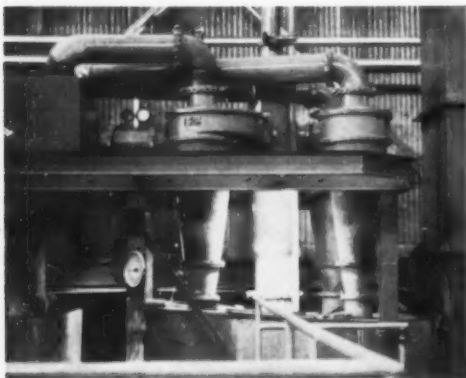
Mining editors concur in these findings and most assuredly spend many hours in the writing and presentation of facts on the printed page for quick and positive assimilation by the mining industry. Thus there is an added factor to clear writing—that of presentation for accuracy of understanding and positive retention.

This is only one instance in which the technical press plays an important part in the education of engineers.

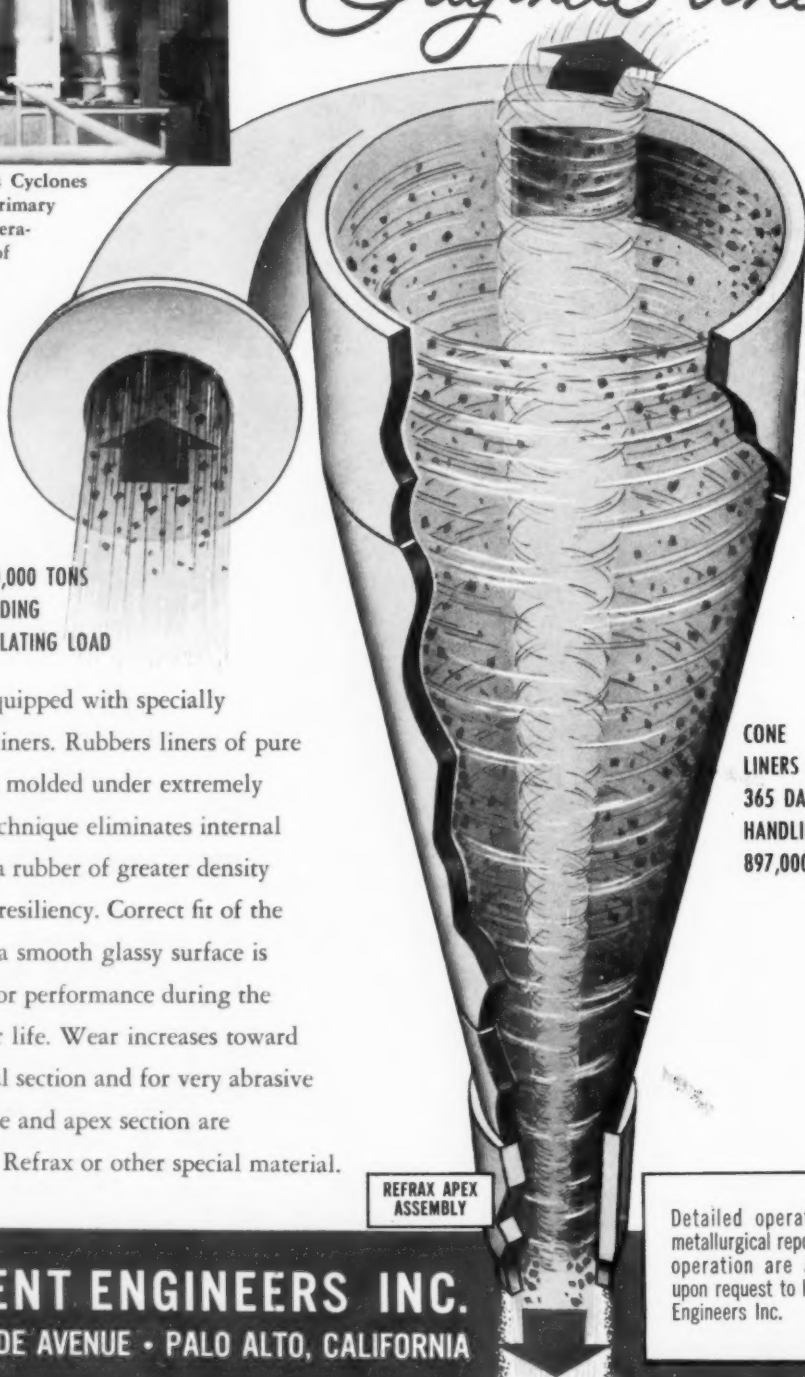
The professors, not surprisingly, found that it is "extremely difficult if not impossible [financially] to publish new texts on mining engineering subjects. Thus texts are grossly out of date." Of greatest value to the students now is the technical press as a means for keeping the mining texts up to date. New methods, better methods, improved equipment are reported in every issue.

Copies of the College of Mines summary are available on request while the supply lasts. Your study of this report and positive action to encourage engineering education will play an important part in advancing minerals technology.

# Each **KREBS CYCLONE** handles 2,050,000 tons of primary ball mill discharge with *Original liner!*



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GOVERNMENT ACTION AND REACTION AFFECTING MINING



## Hearing Scheduled For Wilderness Bill Which Is Against Multiple Use . . .

A new wilderness bill was the subject of the Senate Interior Committee's first scheduled hearing of the current session in Washington, D. C. late in February.

The measure considered was S. 174 which was introduced by Interior Committee chairman Clinton P. Anderson of New Mexico, with 13 cosponsors. Sponsors of the bill say the 1961 version is designed to satisfy reasonable critics of earlier bills, and that it would fully protect existing rights to use of federal lands.

Senator Anderson told the Senate, "It is my purpose to do all that I can

to advance this legislation, and I urge it upon the Senate at the beginning of this Congress as an outstanding opportunity to accomplish an enduring benefit in establishing a sound national policy and program for preserving a precious and significant resource of wilderness.

S. 174 is similar to earlier Wilderness bills. It would establish a Wilderness System composed largely of national forest areas which are now classified as wilderness, wild, primitive, or canoe, but which are still subject to the general mining laws. With limited exceptions, commercial ac-

tivities within the Wilderness System would be banned.

The general mining laws would cease to apply to national forest and public areas included in the Wilderness System—thereby hampering development of the mineral resources and nullifying the principle of multiple use so far as those areas are concerned. Prospecting and mining would be permitted in these areas only when the President determines "that such use or uses in the specific area will better serve the interests of the United States and the people thereof than will its denial."

## Additional Key Interior Appointments Made From Career Men . . .

Interior Secretary Stewart Udall has announced the appointment of Karl S. Landstrom, a native of Lebanon, Oregon, as director of the Bureau of Land Management. He succeeds Edward Woolley of Idaho, who had headed the bureau for nearly eight years.

Landstrom, a career civil servant, has had nearly 25 years of experience in the natural resource field. He joined BLM in 1949, as regional chief of lands and minerals in Portland, Oregon, and in recent years had been a member of the staff of

the House Interior Committee. In making the appointment, Udall said that "Landstrom's experience and understanding of public land management will assure development of progressive policies and programs in concert with the resource conservation goals of the Kennedy administration."

Harold R. Hochmuth was named to the position of associate director of BLM. He has been BLM's lands officer for six years, and succeeds Earl J. Thomas, who was made assistant to the director at a reduction in

salary.

Udall also has announced the appointment of Orren Beaty of Phoenix, Arizona, as assistant to the secretary. Since December 1955, Beaty had served as administrative assistant to Udall while he was a member of the House of Representatives. Beaty was a member of the staff of the **Arizona Republic**, Phoenix, for eight years prior to joining Udall's congressional staff. Another Arizonan, Frank J. Barry, Jr., of Tucson has been confirmed as solicitor for the Interior Department.

## New Move For Mineral Resources Department To Be Established By Congress . . .

The introduction into this Congress of H. R. 2210 by Representative Walter S. Baring of Nevada continues a long series of efforts, begun by former Senator James E. Murray,

to create a United States Department of Mineral Resources. It has long been thought in some quarters that the Interior Department has too many other responsibilities to prop-

erly look after the nation's mineral industries to the best advantage and that a Secretary of Mineral Resources in the President's cabinet would be of inestimable advantage.

## Time Extension Is Requested To Receive Outdoor Report . . .

The Outdoor Recreation Resources Review Commission, Laurance S. Rockefeller, chairman, has requested an extension of five months' time in which to complete its final report and recommendations—until January 31, 1962. The law creating the commission called for its final report by September 1, 1961. Legislation authoriz-

ing the extension has been introduced by Chairman Aspinall of the House Interior Committee.

According to Rockefeller, the commission has been working for about a year and one-half, and the study program is about complete. The task remaining, he said, is to assemble and analyze the large amount of data col-

lected and to report the commission's findings to the President and the Congress.

The major objective of the study, Rockefeller said, is to obtain the answers to the following three questions: (1) What are the recreation

continued on page 10

**THE STEEPER THE GRADE...**

**the more "extra" loads**

**a cycle-gaining Payhauler® gives you**



Of all three 27-ton off-road haulers, only the International 95 Payhauler gives you the weight-shedding, strength-multiplying advantages of the rock-ribbed, corrugated body. Only the "95" is plus-powered by the 375-hp DT-817 turbocharged Diesel. And only the "95" gives you an exclusive combination of power-control, safety, and comfort features that turns haul-speed advantages into extra haul-cycles! *Prove to yourself* what comparative grade charts and work-tally sheets show! See your International Construction Equipment Distributor for a Payhauler demonstration!



▲ **Positive Torqmatic braking** gives the operator complete control of this fully-loaded "95"—builds confidence to use the highest practical haul speeds, even when hauling down the steepest grades. "One-hand" power-steering teams with finger-tip brake lever control to give course-holding, grade-matching downgrade hauling stability. Torqmatic braking, standard equipment on the power-shift "95," is a Payhauler plus—furnished in addition to the standard, internal-expanding wheel brakes—to help give you "extra" loads on tough hauls!

**Grade charts prove: only the 95 Payhauler delivers**



**Total grade and rolling resistance, 10%**

Hauler	Hauling Speed (mph)	Payhauler Advantage
95 Payhauler	10.2	
Competitor X	8.0	27.5%
Competitor Y	8.0	27.5%



**Total grade and rolling resistance, 11%**

Hauler	Hauling Speed (mph)	Payhauler Advantage
95 Payhauler	10.1	
Competitor X	7.0	44.3%
Competitor Y	7.5	34.7%



**Total grade and rolling resistance, 12%**

Hauler	Hauling Speed (mph)	Payhauler Advantage
95 Payhauler	9.0	
Competitor X	6.3	42.9%
Competitor Y	7.0	28.6%



**Total grade and rolling resistance, 13%**

Hauler	Hauling Speed (mph)	Payhauler Advantage
95 Payhauler	7.9	
Competitor X	5.5	43.6%
Competitor Y	6.0	31.7%



Two 65 Payhauler rigs speed full 19-ton loads of dolomite from quarry to crusher—up a maximum climb-out grade of 16%. Powered by the 250-hp naturally aspirated "817" Diesel—equipped with weight-shedding corrugated steel body—the "65" consistently hauls 30% faster than competitive rigs! Price the "65"—you pay less per hp, less per struck yard and per ton of capacity than for competitive rigs!

Three 95 Payhauler trucks replace five competitive haulers in a large Chicago-area quarry. Reasons: fully-loaded "95's" haul up-grade as much as 44% faster than the competitive make—give fast, "big-target" loading—dump in only 11 seconds with exclusive power-up and power-down hoist action. And the cycle-gaining "95's" with Torqmatic power-braking, power-steering and power-shifting deliver "extra" loads on steep hauls!

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A COMPLETE  
POWER PACKAGE



**International<sup>®</sup>  
Construction  
Equipment**

**"extra" loads . . . over any 27-ton competitor**



**Total grade and rolling resistance, 14%**

Hauler	Hauling Speed (mph)	Payhauler Advantage
95 Payhauler	7.2	
Competitor X	5.0	44. %
Competitor Y	5.5	30.9% ↓



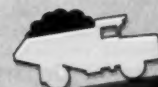
**Total grade and rolling resistance, 15%**

Hauler	Hauling Speed (mph)	Payhauler Advantage
95 Payhauler	6.4	
Competitor X	4.8	33.3%
Competitor Y	5.3	20.8%



**Total grade and rolling resistance, 16%**

Hauler	Hauling Speed (mph)	Payhauler Advantage
95 Payhauler	5.8	
Competitor X	4.6	26.1%
Competitor Y	5.0	16. %



**Total grade and rolling resistance, 17%**

Hauler	Hauling Speed (mph)	Payhauler Advantage
95 Payhauler	5.4	
Competitor X	4.5	20. %
Competitor Y	4.9	10.2%

continued from page 7

wants and needs of the American people and what will they be in the years 1976 and 2000? (2) What are the recreation resources of the nation

available to fill those needs now and in the years 1976 and 2000? (3) What policies and programs should be recommended to insure the meeting of the needs of the present and future?

Spokesmen for the natural resource industries, including mining, have urged Congress not to act on proposals to create a wilderness system until the report of the commission has been received and studied.

## **New Approach Taken By Bill To Assure Healthy Mineral Industry . . .**

Representative Walter S. Baring of Nevada has introduced a new bill, H. R. 2875, "To authorize a comprehensive program for the maintenance of a healthy mining industry in the United States and its possessions."

The bill contains a very strong policy statement about the necessity for as near self-sufficiency in domestic mineral production as possible saying, "dependence upon foreign sources invites possible national suicide."

Provision is made in Title IV for a program "to lessen the dependency of the United States upon foreign sources of minerals and metals, wherever economically feasible, and to provide for interim buffer stockpiles in private ownership." This is an ingenious device for keeping mines running during bad times, "where the national defense or the national economy is imperiled," and, further, would authorize the Secretary of the Interior to "impose such import

quotas, make such incentive payments, and to authorize such barter contracts as may be necessary to maintain or increase such production." He may also put into operation some modern variation of the Premium Price Plan. The barter provision evidently was introduced into the bill so that the economic effect upon producing countries such as Peru could be mitigated.

The private stockpile arrangement is a new concept. If the market price of a metal falls below the cost of production plus a reasonable margin of profit, the government may pay the difference and have the concentrates or ore stockpiled at the mine. When the price rises to a satisfactory point and the material can be sold at a profit it is so sold and the government reimbursed, any excess profits accruing to the mining company. The long-run cost of this device to the government should be nothing and it would prevent the constant opening and

closing of some mines and would preserve the labor force.

Title V, "Program to secure the United States from losing its essential developed and partly developed mineral reserves," is a sort of "soil bank" device for mines. Under the plan, the mine could be retired from production, but the government would pay, by loans, the cost of maintenance, pumping, etc. The money would be paid back when the mine again becomes profitable to operate; or, in case of emergency, the government would have first call on the products at the "then current market price and in such event 10 per centum of such price of any amounts of such production delivered to the Government shall be considered as and credited to repayment of amounts advanced."

Such a bill, however controversial, should be permitted to come to hearings because there surely is a good deal of merit in the Baring proposals worthy of public discussion.

## **Let's Strengthen America for Americans Is Rallying Slogan . . .**

The textile industry is among the nation's industries which are suffering from low-cost foreign competition, as can be seen by the following quotation. It comes from a textile trade magazine, but might well apply to

other segments of the economy, including mining.

"We're told that import quotas and quantitative restrictions would have disastrous effects upon the infant industries of developing countries. What kind of an effect do these glib

spokesmen think low-wage imports are having upon our own industry? It is about time we started thinking about strengthening America for Americans instead of destroying its industry for foreigners who consider us the biggest suckers in the world."

## **Aspinall Offers New Lead-Zinc Plan Which Has Support of Several Groups . . .**

The new Aspinall bill to stabilize the mining of lead and zinc in the United States (H. R. 3416), although containing a subsidy clause for small mines, has been referred to the House Committee on Ways and Means because it is mainly concerned with tariffs.

There are indications that the groups sponsoring previous lead-zinc mining legislation will unite behind this new bill. These include the Emergency Lead-Zinc Committee, which is said to have drafted the bill, and the group which has backed the

Edmonson small lead-zinc mine bill. Just how the so-called smelter groups will react remains to be seen, but it is known that they prefer tariffs to quotas. That there will be loud protests to the State Department from foreign producing countries is a foregone conclusion.

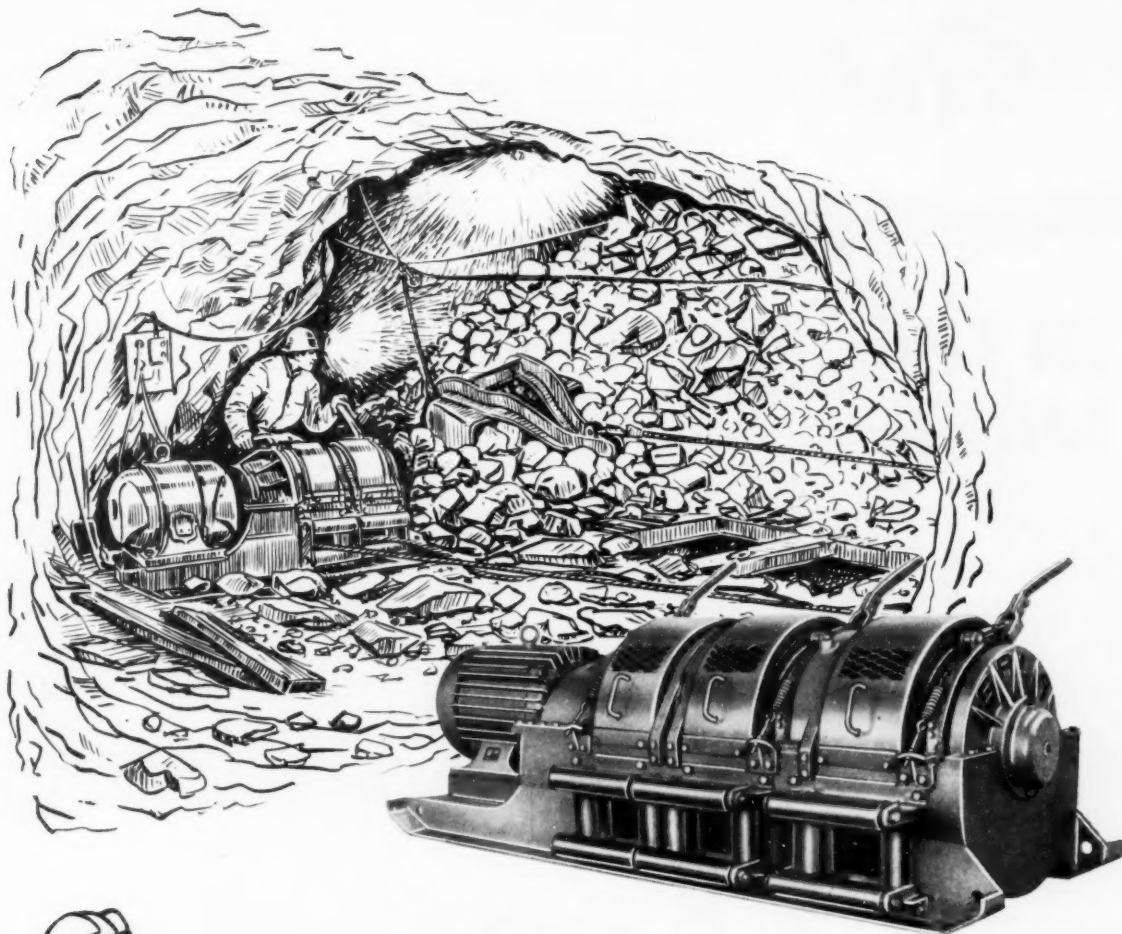
## **Interior Department Decision Further Defines Discovery—Not Mineral Indications . . .**

In the case of *United States v. Harold Ahlstrom et al*, the Department of Interior, on December 16, 1960, issued the following decision pertaining to discovery:

"Any positive reading on an instrument for disclosing radio-activity

is sufficient to indicate the possibility of a subsequent discovery of commercially valuable ore, and may impel a practical prospector to conduct a further search for more valuable ore. However, the test of discovery is not satisfied by a finding of mineral

indications which simply warrant further exploration for a valuable deposit. It is satisfied only by a showing of the probable existence of a mineral deposit that can be developed as a paying mine with a reasonable prospect of success."



## Heavy Scrapers are Easy to Handle with SALA Slushers

Sala's two- or three-drum Electric Slushers range from 30 HP to 90 HP.

The all-welded frame of rugged compact "barrel" design keeps moving parts in line and permits installation on rough surfaces.

Internal, enclosed planetary gears provide un-interrupted service.

All rotating parts are running in SKF-ball or roller bearings.

Lubrication is efficient and only required at long intervals.

Sala's electro-pneumatic remote control (optional) enables the operator to fill scrapers to capacity on inclines and around corners. It is simple to install.

Sala has made Slushers for 25 years and they are now used in many countries, e.g. in Canada for the past 5 years.

Sala handles heavy loads with ease—request Catalogue 104.

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Machinery Center, Inc.  
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### AUSTRALIA

For scraper hoists: ASEA  
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### CANADA

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# SALA MASKINFABRIKS AB

SALA—SWEDEN

# FROM DRILLING TO MILLING...

*Only Cyanamid serves*

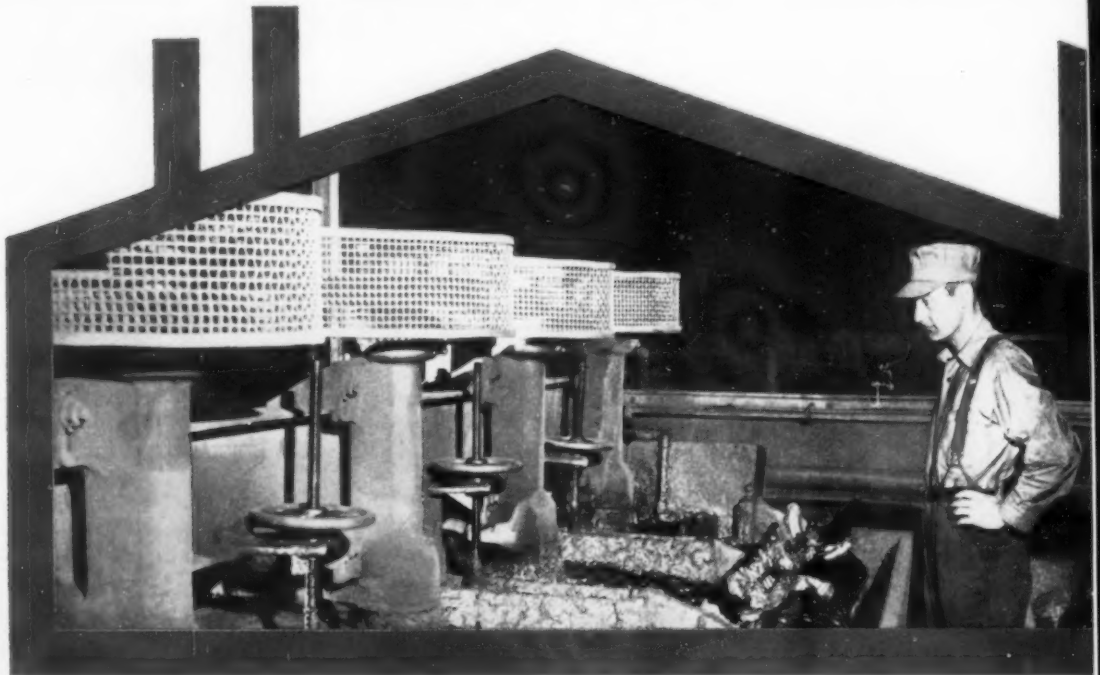
## IN THE MINE...

Open pit or underground, Cyanamid helps you get to paydirt fast!

Whatever the nature of your ore, there's a Cyanamid explosive to break it loose efficiently, in the right size for easy handling. Our representatives will help you select the explosives you need and recommend blasting patterns that will keep production moving.

Cyanamid's new chemical grout, AM-9, provides a better, faster method of controlling water seepage and stabilizing soil during drilling and shafting. Injected into soil in an aqueous solution with a catalyst, AM-9 solidifies into a stiff, permanent, impermeable gel. Viscosity remains essentially that of water up to gel time so solution will permeate any formation through which water will flow. Gel time is controlled by choice of catalyst.

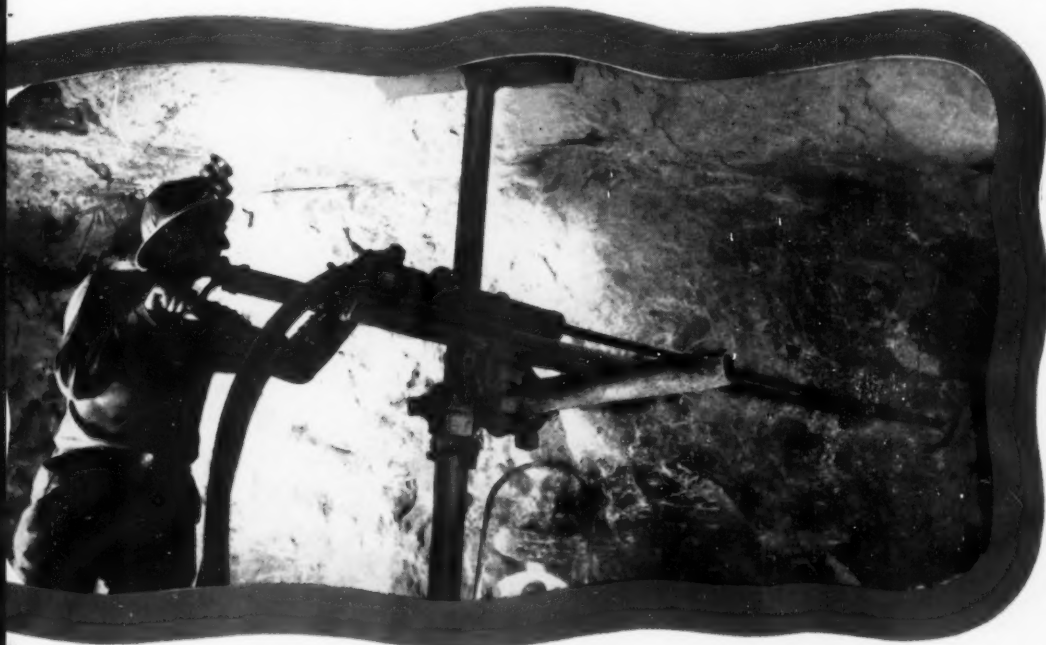
The Cyanamid Explosives Line: High Explosives • Permissibles • Seismograph Explosive  
Blasting Agents • Electric Blasting Caps • Blasting Caps and other Blasting Accessorie



*from drilling to milling, specify*

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*mining so completely!*



## **IN THE MILL...**

To help you get the most from your ore, Cyanamid offers the widest range of metallurgical chemicals available from a single source.

In addition to the chemical tools, our Field Engineers provide first-hand, in-the-mill assistance in their use. From a comprehensive knowledge of the best world-wide ore dressing technology, he can frequently suggest mining chemicals that will help you cut costs and improve metallurgy.

His assistance and the services of the Cyanamid Mining Chemicals Laboratories are available to large and small customers alike.

The Cyanamid Mining Chemicals Line: Cyanidation Process Chemicals • Flotation Reagents • Flocculating Agents • Film Forming Agents • Surface Active Agents

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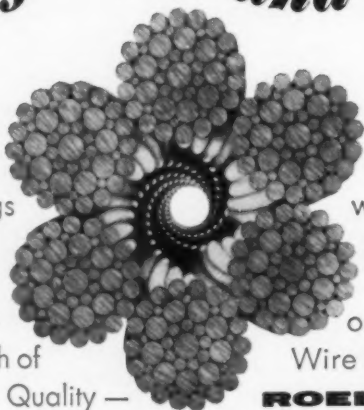
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We put a lot of work into it  
You get a lot of work out of it



*quality inside and outside*

Take a good look at the pictures. They show you where your savings really start — with the inner and outer uniformity of wires and strands. Unseen, but of utmost importance is the extra high strength of Roebing Royal Blue Wire Rope. Quality —



inside and outside — is the extra working factor that pays off on the job for you. Find out more from your wire rope distributor, or write for free booklet to Roebing's Wire Rope Division, Trenton 2, N. J.

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## **Eighteen convenient smelters and refineries**

ASARCO: Buyer, smelter, refiner of gold, silver, lead, copper and zinc ores and blister copper, concentrates, mattes and residues. Fourteen domestic and four Mexican plants located for maximum accessibility as follows:

### **LEAD SMELTERS**

Selby, California  
East Helena, Montana  
El Paso, Texas  
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### **ZINC SMELTERS**

Amarillo, Texas  
Corpus Christi, Texas  
Rosita, Coah., Mexico

### **COPPER SMELTERS**

Hayden, Arizona  
El Paso, Texas  
Tacoma, Washington  
San Luis Potosi, S.L.P., Mexico

### **LEAD REFINERIES**

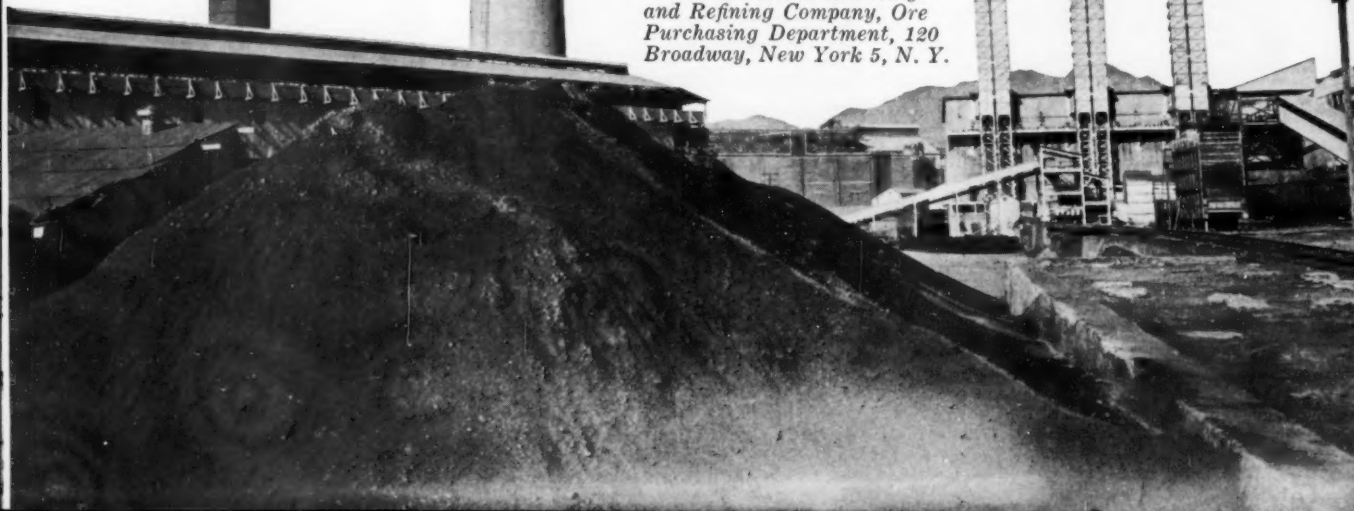
Selby, California  
Omaha, Nebraska  
Perth Amboy, New Jersey  
Monterrey, N.L., Mexico

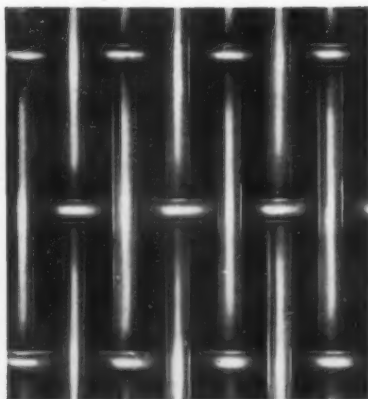
### **COPPER REFINERIES**

Baltimore, Maryland  
Perth Amboy, New Jersey  
Tacoma, Washington

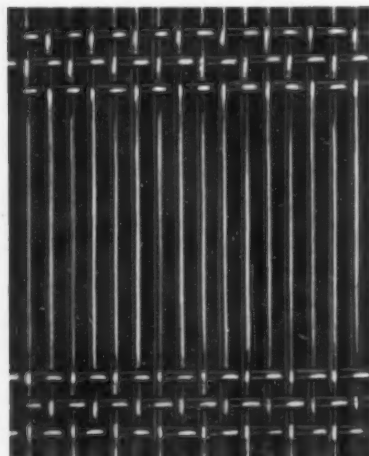
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write to the plant nearest you  
or to: American Smelting  
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# ASARCO

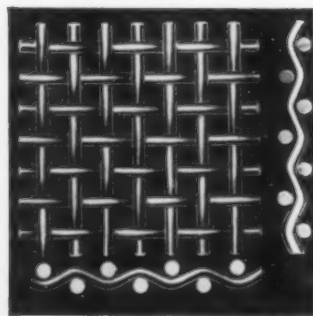




**MAXIMUM THROUGHPUT** — CF&I Space Screens with Rectangular Openings have high percentage of open area, provide considerable freedom from blinding and clogging.



**FREEDOM FROM CLOGGING AND BLINDING** — The greater open area of CF&I Long Slot Space Screens, plus intense vibration of wires on the long sides of openings, prevents material build up.



**LONG LIFE** — Even under severest operating conditions Double Crimp cloth is most effective. That's because it's built so all wires get equal wear.

You get  
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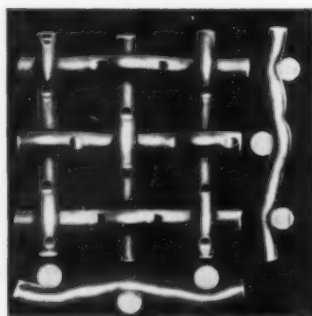
## CF&I Space Screens



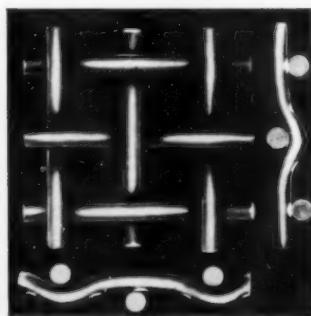
Whether you want high throughput, maximum accuracy or long service life, there's a CF&I Space Screen that will give you the results you're looking for. You can choose from screens with almost any combination of openings, weaves and crimps, edge preparations and effective open areas. CF&I has the experience and facilities — as symbolized by our Corporate Image — to supply screens to meet your most exacting requirements.

All CF&I Screens are available in a complete range of metals including carbon, alloy and stainless steels, aluminum, bronze, Monel and many other alloys. For further information on the screens described here or on any in the CF&I line, contact a local CF&I sales office.

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**VERY ACCURATE SIZING** — Because each wire of Lock Mesh Cloth is constructed in a "locked-in" position, it's one of the best available for vibrators and trommels.



**MINIMUM RESISTANCE TO MATERIAL FLOW** — With all the crimping on the underside, CF&I Space Screens with Flat Weave set up minimum turbulence to materials going through.

## CF&I SPACE SCREENS

THE COLORADO FUEL AND IRON CORPORATION

In the West, THE COLORADO FUEL AND IRON CORPORATION — Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso • Farmington (N.M.) • Ft. Worth • Fresno • Houston • Kansas City • Lincoln • Los Angeles • Oakland • Oklahoma City • Phoenix • Portland • Pueblo • Sacramento • Salt Lake City • San Francisco • San Leandro • Seattle • Spokane • Wichita  
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CF&I OFFICE IN CANADA: Montreal

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Working on the Cross Westchester Expressway in New York State, Mount Vernon Contracting Corp. put Amsco Simplex Teeth on its four shovels and two backhoes. Teeth previously used required daily welding build-up to maintain points. Since switching to Amsco Simplex, teeth are changed only about once a week. And change-over is only a 5-minute job.

# SWEET TOOTH

Best way to test a tooth: take it to quarries, mines and construction projects across the country. Put it on shovels, dippers and hoes alongside leading competitive teeth. Then wait and see what happens.

Two years ago, this is how we tested the Amsco Simplex\* 2-Part Tooth. It lasted from 2 to 4 times longer than leading competitive teeth—even before reversal. So much for tests. Now we have reports from hundreds of customers, telling us that Amsco Simplex is the longest-wearing tooth they ever had.

They're easy to buy, too: Major shovel manufacturers can furnish Simplex Teeth as original equipment. To take care of your current needs, shovel dealers stock them in a full range of adapters and tip styles. Try Amsco Simplex first chance you get. We think you'll agree with our customers that Amsco Simplex is a sweet tooth all the way.

For complete ordering information, write us for a copy of the Amsco Simplex Buyers' Guide.



**AMSCO  
SIMPLEX  
2-PART  
TOOTH**  
Available through major shovel manufacturers and dealers, in a full range of adapters and tip styles.

\*Patent No. 2,904,908

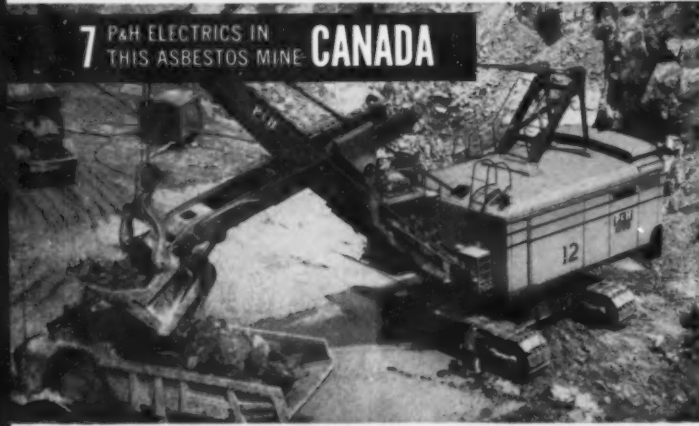


# AMSCO

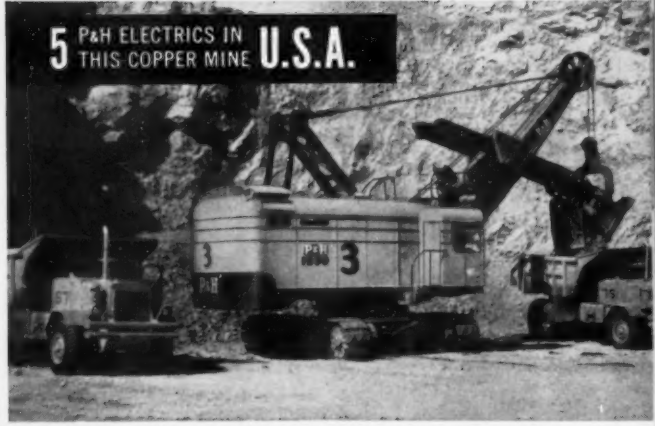
American Manganese Steel Division • Chicago Heights, Ill.  
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12 P&H ELECTRICS IN THIS COPPER MINE PERU



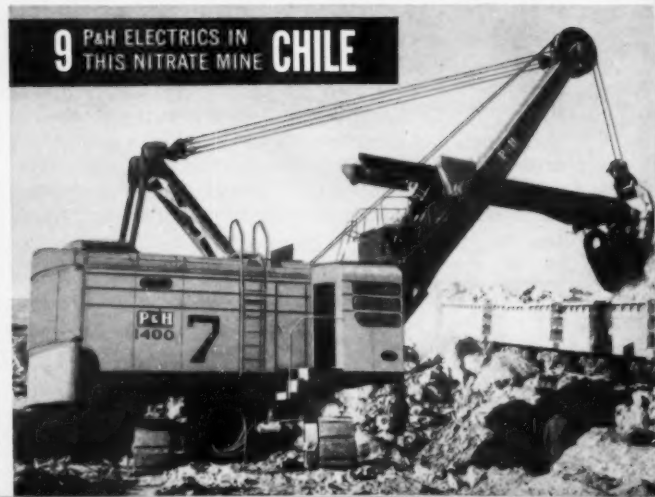
7 P&H ELECTRICS IN THIS ASBESTOS MINE CANADA



5 P&H ELECTRICS IN THIS COPPER MINE U.S.A.



4 P&H ELECTRICS IN THIS IRON MINE U.S.A.



9 P&H ELECTRICS IN THIS NITRATE MINE CHILE



Throughout the Americas...

# More mines are STANDARDIZING on P&H ELECTRIC SHOVELS

...more evidence that  
one P&H always sells another

Look at the evidence: Count the P&H Electric Shovels now in use in each of the mines shown here. It's the same story you'll find in mine after mine: once a P&H electric shovel is on the job, performance records show production increases and lower unit costs that simply make it good business to standardize on P&H. Because more mines are following this trend, Harnischfeger now is the world's largest builder of full electric and diesel-electric shovels.

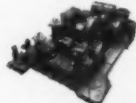
P&H Electric Shovels incorporate many dramatic new design fundamentals which make them different from all others.

Foremost is MAGNETORQUE® drive—the exclusive *patented* hoist drive that puts more material into the dipper, faster—with every pass! It is the most productive digging motion drive known for electric shovels, producing higher bail pull, greater dipper fill factor and automatic impact protection for the hoist machinery.

## FIVE EXCLUSIVE P&H FEATURES



**MAGNETORQUE DRIVE**  
Electro-magnetically transmits full digging power of A.C. motor direct to dipper—without motor generator set conversion to D.C. current.



**FULL WELDED STEEL CONSTRUCTION**  
Unit-welded rolled steel design pays dividends in exceptionally long shovel life in hard digging.



**ENCLOSED HOIST MACHINERY**  
No open gearing—all power trains for hoist, swing and propel drives are enclosed in oil-tight gear cases.



**INDEPENDENT CRAWLER PROPEL MOTION**  
P&H gives you independent motors for each function—the basic principle of electric shovel design and purpose.



**HIGH STRENGTH T-1 STEEL**  
Only Harnischfeger uses it as *standard* in fabricating a boom and dipper handle with highest impact absorption ability.

Another major reason why "One P&H Always Sells Another" is single-source responsibility for service. Harnischfeger is the only shovel manufacturer which makes its own electrical as well as mechanical com-

ponents—all designed and matched by a single manufacturer *specifically for balanced electric shovel production cycles*. For more information write Harnischfeger Corporation, Milwaukee 46, Wisconsin.

# HARNISCHFEGER

Milwaukee 46, Wisconsin



Now, load faster, more safely than ever before . . .

# NEW GARDNER-DENVER "WORK

## MODEL GD18

Controls for traction and dipper action placed for ease of operation—no mechanical linkages.

Chain equalizer bar shaft

Full 9-cu.-ft. dipper capacity.

Upper deck pivots on tapered roller bearings.

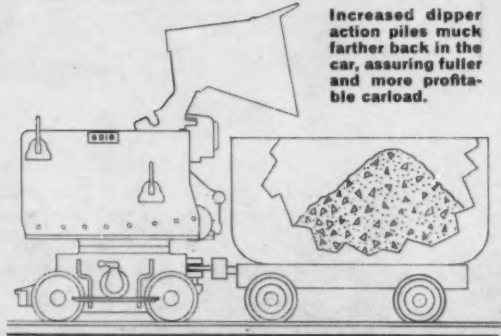
Heavy-duty, rugged, positive clutch.

### SPECIFICATIONS

Clean-up width	105"
Track gauge	18" to 36"
Weight—Standard	7530 lb.
High	7950 lb.
Dipper capacity	9 cu. ft.
Traction motor hp	15 at 90 psi
Dipper motor hp	17 at 90 psi
Necessary air pressure	50-100 psi
Size air connection	1½"

### MORE PAY LOAD

Increased dipper action piles muck farther back in the car, assuring fuller and more profitable carload.



# HORSE" MINE CAR LOADER

## 4 BIG REASONS WHY THE GD18 IS YOUR BEST BUY—ANYWHERE

**MORE POWER**—Highly increased dipper and traction motor hp. And you can use every bit of it. Weight distribution and force leverages are balanced with this extra hp.

### UNMATCHED PERFORMANCE

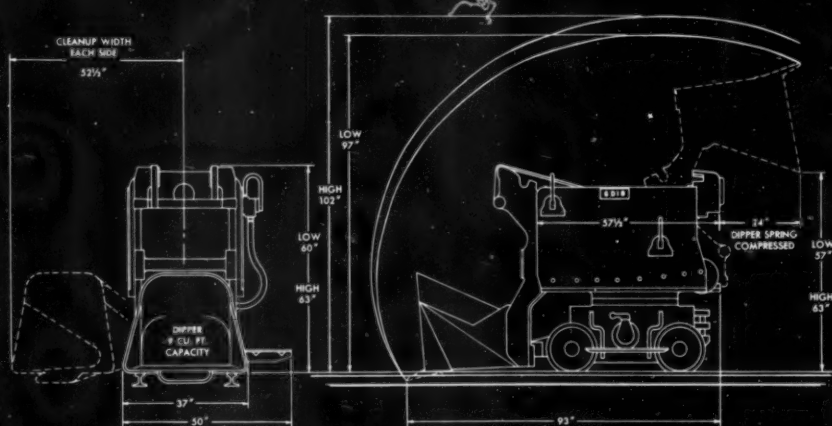
—Faster loading rate per car—proved by actual competitive tests in iron ore at any pressure from 50 to 100 psi. You get more tons per carload—increased dipper power throws muck peak farther back in the car.

**PROVED RELIABILITY**—Years of extensive field testing *proved* the design . . . *proved* low operating and maintenance costs . . . *proved* increased production with fewer delays.

### MAXIMUM SAFETY

—Excellent weight distribution provides stability regardless of track gauge—better than any other loader. Reliable centralizing and minimum effort, required to position dipper, safeguard operator . . . enable him to get high performance with ease.

### DIMENSIONS



### OTHER FEATURES

- Smooth, positive centralizer action
- Easily converted to high or low construction
- Traction and dipper motors have same internal parts
- Five-cylinder radial air motors
- Three-point lubrication
- Crown-shaped gears
- Single, enclosed shock spring for dipper
- Steel wheels
- Unitized component assemblies—interchangeable
- Self-cleaning dipper arm guides



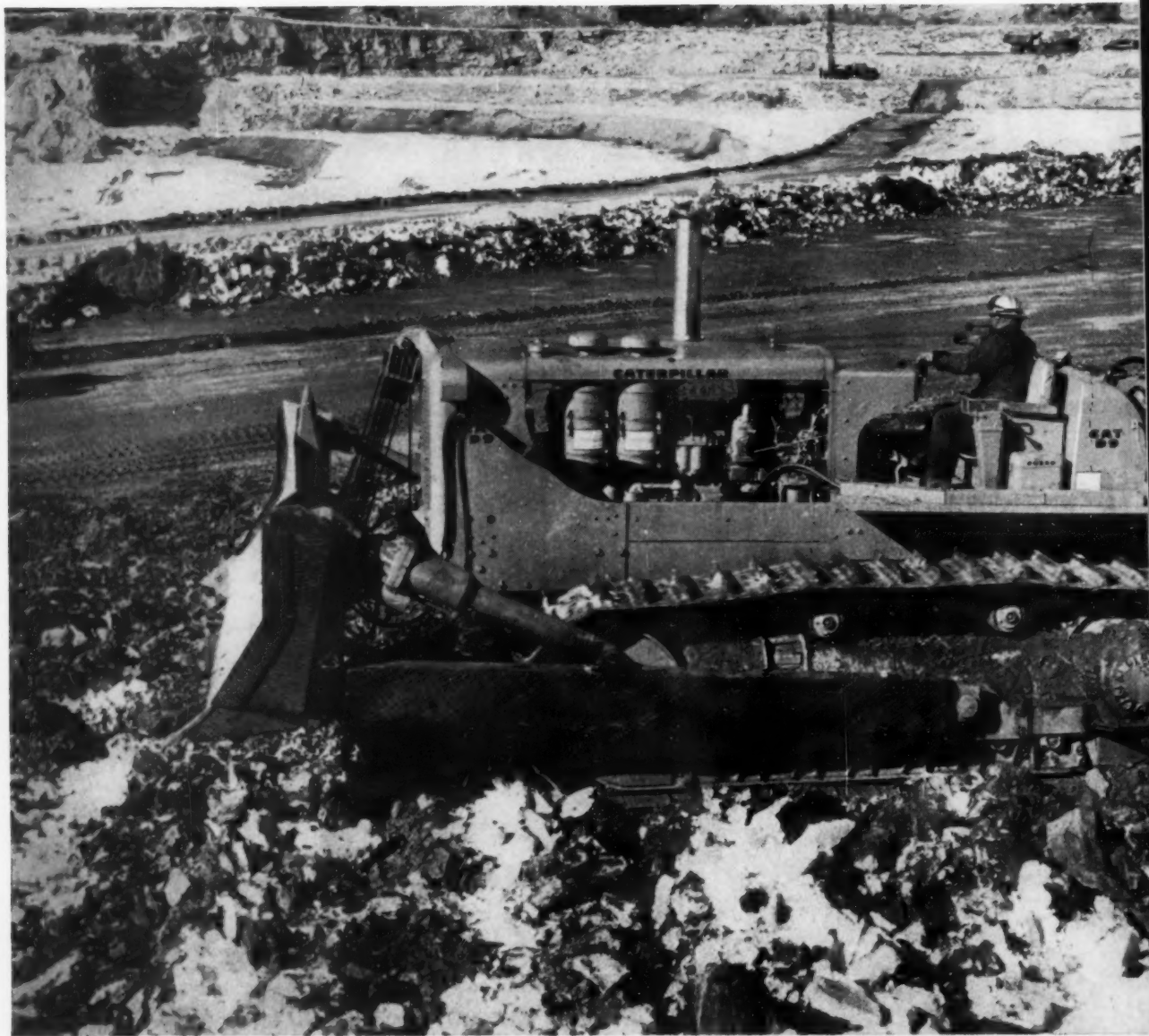
EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

# GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

International Division, 233 Broadway, New York 7, New York

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Ave., Toronto 16, Ontario



## If you're blasting rippable material, your money's going up in smoke

Mining operations are getting quieter. The reason is that more and more owners are replacing expensive blasting of ore and overburden with relatively inexpensive ripping.

The silence will never be complete, of course. Some material is simply not rippable, even with the brute strength of the big Caterpillar D9E Tractor.

But where material *is* rippable, it is considerably cheaper to rip than to drill and blast. Simple arithmetic supplies the most important reason. Add up these costs: power source, compressor, drills, drill bits, labor and supervision for drill and powder crews, dynamite truck, powder and primer, insurance, access roads and benching for drilling equipment.

Then compare the total with the

owning and operating cost of a ripping tractor.

And there are other cost-saving advantages in ripping:

1. Ripped pieces of material tend to be smaller than blasted pieces, which means easier, faster handling and increased production. The spacing, depth and direction of ripping passes can be varied to obtain the desired size pieces, eliminating





## HOW RIPPING WITH A D9E SOLVED A DIFFICULT AND UNUSUAL MINING PROBLEM

Mining of the main deposit had been completed at a uranium mine—but an excess of 50,000 tons of commercial grade ore still remained in scattered lenticular deposits around the bottom of the pit. They varied in depth from two to six feet, some occupying areas as great as 1000 square feet.

Problem: how to mine them economically.

Blasting would have been uneconomical since the commercial grade ore would have been diluted with surrounding low-grade ore and waste material. Shovel excavation without prior shattering would have been extremely slow, if possible at all.

Engineers suggested trying a tractor-mounted ripper. Tests indicated that this was the answer, and mine supervisors ordered a Caterpillar D9E Tractor with power shift transmission. Attachments included a No. 9 Ripper with two teeth and a No. 9S Bulldozer with tilt cylinder to give added prying action in digging out ore chunks

in the more heavily consolidated portions of the formation.

The material is first ripped to a depth of 28 inches on 4-foot centers. Then it is cross-ripped (shown in photo at left) to break the heavily consolidated ore into easily handled pieces for shovel loading. The D9E bulldozes the pieces into a pile for loading into hauling units. Ripping and bulldozing production averages from 300 to 500 cu. yd. per hour. In addition the D9E handles road maintenance.

No other machine is as well suited to this kind of rugged mining work as the D9E. With 335 HP (flywheel) and a massive, long-lived undercarriage, it has the power and stamina to do the job. But, more important, it can do the job at *reasonable cost*. For the D9E's rugged construction and dependable Cat Engine mean that it stays on the job hour after hour, day after day, doing the work you bought it for.

Talk over your ore and overburden removal problems with your Caterpillar Dealer. If it is his best judgment that Cat-built equipment is the answer—he's ready to prove it to you with a demonstration.

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U. S. A.

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

expensive and time-consuming secondary blasting.

2. Ripping is safer than blasting. And in many cases this can mean lower liability insurance rates.

3. A ripping tractor offers the extra dividend of availability for various bulldozing jobs when it has completed its ripping assignments.


All told, the savings can be quite considerable. In fact, it is a rule of thumb that a ripping tractor used on a production basis can loosen ore and overburden for one-third to one-half the cost of drilling and blasting. In many cases, savings even top that. For example, on the Mesabi

Range rock was ripped with D9s for 10% of the cost of drilling and blasting.

The chart below gives some ex-

amples of typical savings. All are actual cases where Caterpillar track-type Tractors with rippers replaced drilling and blasting.

LOCATION	MATERIAL	Ripping Costs (Cents/Cu. Yd.)	Drilling and Blasting Costs (Cents/Cu. Yd.)
Tulsa, Oklahoma	Limestone	7.3	17.3
Dallas, Texas	Limestone	5.2	15.1
San Francisco, Calif.	Sandstone	15.0	30.0
Merriam, Kansas	Sandstone	2.1	11.7
Nelsonville, Ohio	Sandstone	5.7	13.8
Philadelphia, Pa.	Limestone	11.5	19.3
Carbo, Virginia	Sandstone	8.6	15.7
Hibbing, Minn.	Frost	25.0	60.0
Hibbing, Minn.	Paint Rock	6.1	54.5



**No matter how you figure it . . .**

## **"EUC" Rear-Dumps are your best investment!**

When you're comparing rear-dump haulers—or any other earthmoving equipment for that matter—reliable performance on the job is the only real measure. For over 25 years Euclid Rear-Dumps have been the outstanding choice of contractors, mines, quarries and industrial users . . . and today more than half of the orders for new "Eucs" come from previous and present owners.

This repeat business is the best evidence of customer satisfaction with performance on the job and with the parts and service facilities of the experienced Euclid dealer organization. You can depend on "Eucs" for greater work-ability and for bonus benefits that don't show in the specs but help to make Euclids your best investment.

**EUCLID Division of General Motors, Cleveland 17, Ohio**

*Plants at Cleveland and Hudson, Ohio and Lanarkshire, Scotland*

---

*EUCLID pioneered the major rear-dump features that are "standard" today . . . planetary drive, exhaust heated bodies, double acting hoist, Torqmatic Drive and other engineering advances that cut hauling costs.*

---



# **EUCLID**

**FOR MOVING EARTH, ROCK, COAL AND ORE**



## Cleveland Cliffs Will Develop Empire Mine in Michigan

First low grade magnetic iron ore deposit to be developed in northern Michigan will be the Empire mine, 2½ miles south of Negaunee. The Empire Mining Company, operated by the Cleveland-Cliffs Iron Company, will develop a mine, build a magnetic concentrator, and construct a 1,000,000-ton-per-year pelletizing plant.

Since the iron mineral in the jasper rock at the Empire mine is magnetite, it will be concentrated by magnetic separators, rather than by flotation used at the nearby Humboldt and

... for magnetic separation and pelletizing

Republic mines, operated by Cleveland Cliffs. The crude ore, containing about 30 percent iron, will be mined by open pit and then beneficiated in a large crushing, grinding, and separation plant to produce a concentrate assaying over 65 percent Fe. The concentrate will then be pelletized for shipment to Lower Lake blast furnaces.

Engineering and pilot studies for the taconite project are under way

and the plant is scheduled for completion in 1963. With production from the Empire, the tonnage of pellets produced annually by Cleveland-Cliffs and partners on the Marquette Range will reach 3,250,000.

Empire Mining Company was formed last year to take over the Empire property from Marquette Iron Mining Company, which was created in 1956 to lease the Republic and Empire mines.

## Columbium Flotation To Be Tested at Quebec Pilot Plant

A 250-ton-per-day pilot plant to be built by Columbium Iron Mining Products Ltd. in Quebec will use a patented flotation process that can produce concentrates grading 45 to 48 percent columbium pentoxide. In final mill tests completed recently the overall recovery rate was approximately 85 percent. The 150-ton bulk ore sample averaged 0.4 percent  $Cb_2O_5$ , so the ratio of concentration was better than 100 to 1.

Diamond drilling by Columbium Mining on its Oka area columbium property which lies about 25 miles west of Montreal, has indicated 106,000 tons containing 5.0 pounds of  $Cb_2O_5$  in approximately one-fifth

of the potential zone, of which some 38,000,000 tons average about 8.0 pounds per ton.

A close-interval grid drilling program is being continued to determine open-pit limits and delineate zones of various grades. This drilling to date has covered 10,000 feet at 80-foot intervals to a depth of 200 feet. Since horizontal widths range from 90 to 350 feet, low-cost, open pit mining seems feasible.

Purchase agreements have already been made with W. R. Grace & Company of New York and Metallgesellschaft A. G. of West Germany. Initial capacity of the mill will be about 750,000 pounds of columbium pent-

oxide annually.

The flowsheet developed by Columbium Mining eliminates 99 percent of the feed as waste, using a technique based on selective flotation of columbium minerals and one tabling step. After the primary float, tailings can be returned to any point in the circuit for additional recovery without retreatment.

The method is particularly suited for the Oka type columbium minerals in which pyrochlore is predominant. The process also recovers columbium from betafite, niocalite, and perovskite. The Oka deposit also contains thorium, uranium, rare earths and magnetite.

## Florida Phosphate Producers Expand to Meet Rising Demand

Phosphate producers in central Florida, which provides over 70 percent of the United States output, continue their expansion to meet the rising demand for phosphate in making high analysis fertilizers. Much attention is centered on increasing capacity for triple super-phosphate production and on processing a new compound, diammonium phosphate, which contains both phosphate and nitrogen.

First diammonium phosphate plant in Florida and one of the few in the country is near completion at Nichols. The \$1,000,000 DAP plant of Virginia Carolina Chemical Corporation will produce at least 100,000 tons an-

nually, and have storage facilities for 10,000 tons.

International Minerals & Chemical Corporation plans a \$5,000,000 expansion-modernization program at its Polk county phosphate operations that will include a new dragline. Improvements at two plants will double the wet rock storage and drying capacities, treble grinding capacity and provide for dry rock screening at the Noralyn unit where a \$1,000,000 calcining plant is to start up soon.

At Ridgeway, Florida, W. R. Grace & Company's Davison Chemical Division has completed extensive modernization and expansion of phosphate rock mining facilities at its

Bonny Lake mine, which now has two Dorr-Oliver hydrosillators, first to be used in the Florida phosphate field. A table concentrating plant that has aluminum decks is used in the feed preparation system.

A new phosphate plant near Fort Meade, together with a nitrogen plant in Alabama, will approximately triple the Armour Agricultural & Chemical Corporation production of nitrogen and concentrated phosphate plant food materials. The Florida unit, part of Armour's \$60,000,000 expansion program, will have a phosphoric acid plant, a triple superphosphate facility and two sulphuric acid processing units.

## American Zinc's Deep Drilling Locates Missouri Iron Deposit

Deep diamond drilling by American Zinc, Lead & Smelting Company beneath the town of Bourbon, Missouri has now delineated a major iron ore deposit. In its joint venture with Granite City Steel Company, begun in 1956, American Zinc has completed 16 holes with an average depth of 2,690 feet, and is now drilling three more that will reach 3,500 feet.

Core assays indicate the ore is 25 to 40 percent iron; its composition is 100 percent magnetite.

The Bourbon drilling indicates there is a complex series of oval-shaped bodies in the Pre-Cambrian basement formation that are superimposed one upon another. The ore lies at depths ranging from 1,700 to 3,500 feet below the surface, in thickness varying from 700 to 1,700 feet.

The presence of an iron ore deposit has been indicated for some 30 years because of the magnetic anomaly associated with it. However, because the apparent location of the deposit was directly beneath the town of Bourbon, as indicated by the anomaly, drilling was undertaken only recently.

During the first two years of drilling by American Zinc, the prospect was discouraging until geologists realized they had begun the program at the wrong end of town. More encouraging results began to appear early in 1960, and with each succeeding test hole the deposit showed



more promise. It is now expected that it may contain as much as 100,000,000 tons of ore.

In preparation for establishing a large-scale mining and beneficiation operation, American Zinc has acquired rights to an additional 1,000 acres of property south of Bourbon for a mill site. The project, which calls for an expenditure of \$25,000,000 to \$35,000,000 will include a deep underground mine, a concentrating plant with a capacity of 10,000 tons of ore per day, a pelletizing plant, and related facilities. The com-

pany plans to push construction work as fast as business conditions and land situations will allow.

Core samples have been used for metallurgical tests. Engineering evaluations and flowsheet design studies are now being made by American Zinc, which will manage the project.

Transportation of the Bourbon ore will present no problem, since the mainline of the Frisco Railway runs over the ore body. Another factor of importance in the development is the close proximity of the area to Granite City Steel Company's steel mill at Granite City, Illinois now supplied by ore from the Minnesota Iron Ranges or from overseas.

This is the second deep iron ore development in east central Missouri at present. The first to get under way is at Pea Ridge, 10 miles to the east where St. Joseph Lead Company and Bethlehem Steel Corporation are developing a 100,000,000 ton deposit through Meramec Mining Company. This is expected to be in full operation by 1962.

The ore at Pea Ridge averages up to 55 percent iron and contains some hematite. The ore there is believed to lie in one nearly vertical lens.

American Zinc and Granite City have also explored near Boss and Bixby, in Dent and Iron counties, Missouri. Both iron and copper deposits have been located, but further development awaits tests on beneficiation processes.

## Marcona Expands Iron Beneficiation—Pelletizing Planned

The Marcona mines of Peru, 280 miles south of Lima, have now become one of the largest and richest iron ore deposits in the world with proven reserves of over 200,000,000 tons, and exploration continually adding to reserves. To mine this tonnage at an increasing rate, the Marcona Mining Company now plans a new investment of \$20,500,000 for additional grinding and pelletizing facilities. This investment will be in addition to the \$22,500,000 beneficiation plant and loading dock now being built at San Nicolas Bay, which will be completed this year. With this new grinding and pelletizing expansion the current total investment by the company will be some \$43,000,000.

The plans for additional plant capacity to handle highly magnetic pri-

mary ores are now being finalized, and construction on these new facilities is expected to start shortly.

The new grinding section will receive primary ore crushed to  $\frac{3}{4}$ -inch. This will be fed to four 10- by 15-foot rod mills driven by 700 horsepower motors for primary grinding, and four 11- by 22-foot ball mills driven by 1,250 horsepower motors for secondary grinding. The coarse fraction of 10 mesh material will be classified in cyclones as a shippable sinter concentrate having an analysis of 67.0 percent Fe, 1.0 percent S, and 3.0 percent  $\text{SiO}_2$ . The finer material will be reground in the ball mill to 70 percent minus-325-mesh with an analysis of plus 70 percent Fe as pellet feed.

The finely ground concentrate will be thickened and filtered, and made

into green balls on an inclined disc before being fed to a Lurgi grate pelletizing machine. Here, it will be heated by fuel oil burners to 1,000° C. to be hardened into pellets.

It is anticipated that the above facilities will produce 1,000,000 tons of sinter concentrate and 1,000,000 tons of pellet feed annually. The plant is designed so that additional equipment and facilities can be added to expand production in increments to an annual capacity of 10,000,000 tons without interference in the present designed production.

The Marcona Mining Company, 86 percent owned by the Utah Construction and Mining Company of San Francisco, and Cyprus Mines Corporation of Los Angeles, California, is now completing construction on a new multi-circuit beneficiation

plant on San Nicolas Bay, 11 miles north of the present shipping port of San Juan on San Juan Bay. This \$22,500,000 facility is expected to be in operation by the end of 1961, and will have a capacity of 1,300,000 tons of concentrate annually. It is designed to up-grade lean ores and treat high sulphur ores producing a suitable high-grade product for blast furnace and electric furnace use. (See MINING WORLD, May 1960, pages 42-43)

Other facilities now under con-

struction at Marcona include a new conveyor transportation system that will carry ore from the mine three miles by conveyor belt over steep coastal benches. This conveyor will probably be expanded in the future to provide a complete conveyor transportation system between the mine and San Nicolas. A new prestressed concrete loading dock is being installed at San Nicolas to provide shipping capacity up to 10,000,000 tons per year while handling ships up to 45-foot draft. A new 10,000-

kilowatt Diesel-driven generating plant is being installed to handle the present power requirements and electrify the mine operation. Additional storage facilities are being provided for fresh water and Diesel fuel, as well as new offices, warehouses, and shop equipment.

It is predicted by officials of the Marcona Mining Company that within a relatively few years the Marcona-San Juan-San Nicolas area will be one of the largest industrial complexes in South America.

## Kaiser Steel's Open Pit Iron Ore Mine Awarded Plaque

Eagle Mountain mine manager Martin Hughes accepts the plaque honoring the "Open Pit Mine of 1960" from George O. Argall, Jr., Editor of MINING WORLD at a special ceremony on January 27th.

The presentation was made at the Eagle Mountain, California recreation hall of Kaiser Steel Corporation at a meeting of mine production and maintenance crews. In making the presentation recognition was given to Kaiser Steel, the management and technical staffs, and the men and women of Eagle Mountain for making the mine a development and testing ground for open pit equipment and mining methods. The entire mining industry has profited by developments made here in trucks, large size hard rock drilling machines, carbide bits, and blasting agents.

Eagle Mountain was honored too for its operating efficiency in achieving outstanding production rates per man shift, low stripping and mining costs, and an excellent safety record.

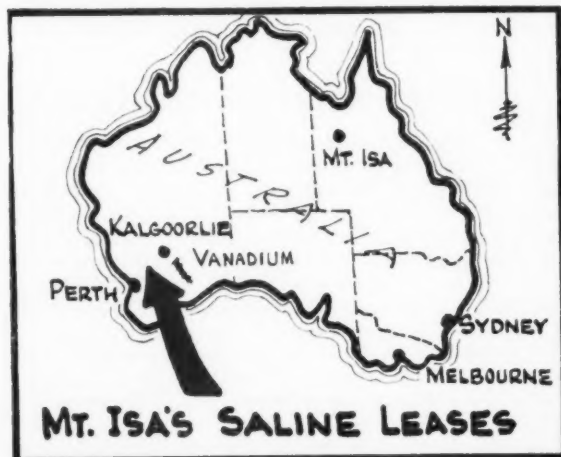
Kaiser Steel's acknowledgement of this award was made by Jack L. Ashby, president, when he said to the men and women of Eagle Mountain that, "It is a great source of satisfaction to me to learn that Eagle Mountain has been selected as the Open Pit Mine of the Year by MINING WORLD. This means that professional recog-



nition has been given to the fine work being done by the men and women of Eagle Mountain. I am happy to add my thanks and appreciation for the fine job to which this award gives recognition."

## Mt. Isa Seeks Saline Minerals in Western Australian Playas

Mount Isa Mines Ltd., Australia's leading producer of copper and silver, has been granted a 12-month mineral reserve to investigate Western Australia's saline lakes



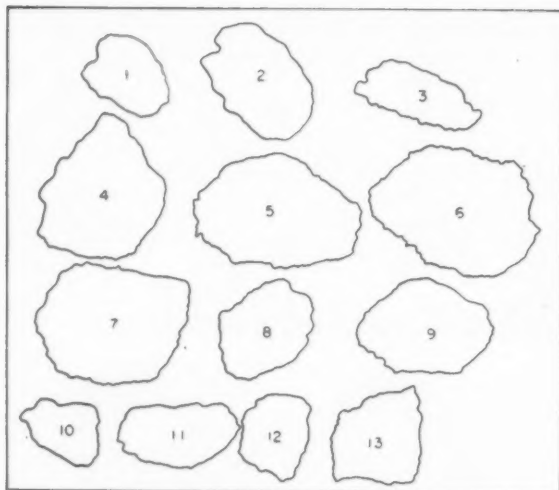
which may contain borax, potash, salt, gypsum, alunite, and clays. The permit covers 12,800 square miles in a roughly rectangular area between York, south of Perth, and Southern Cross to the east as shown on map.

Of special interest is the possible discovery of potash, which would find ready local markets for use in fertilizers. Any borax discoveries would also prove of considerable value. While it is still too early to know if these lakes are comparable in minerals content to California's famed Searles Lake, the Western Australian playas are similar in many respects.

This investigation is only part of Mount Isa's continuing exploration throughout the continent, which currently includes searching for lead deposits in Northern Territory. In addition to its copper activity, Mount Isa is the world's second largest silver producer, and has a substantial output of lead and zinc.

Also shown here is the area where Union Carbide Corporation holds large areas covering vanadium deposits. The vanadium is associated with ilmenite and was discovered by Carbide geologists searching for manganese deposits. Mineralization is extensive over a great distance, but it is not continuous ore by any assay results.

# Beryllium minerals in color-key to cover



## U.S. Beryllium Corporation ores

- |    |   |
|----|---|
| 1  | <b>Beryl-bertrandite greisen ores</b>   |
| 2  | High temperature veins  |
| 3  | Boomer and Redskin mines, Badger Flats<br>Lake George district, Park County, Colorado |
| 4  | <b>Crystalline beryl ores</b>   |
| 5  | High temperature veins  |
| 6  | Boomer mine, Badger Flats   |
| 7  |   |
| 8  | <b>Crystalline beryl ores</b>   |
| 9  | High temperature veins<br>Blue Jay mine, Badger Flats                                 |
| 10 | <b>Beryl crystals</b>   |
| 11 | Pegmatite dikes   |
| 12 |   |
| 13 | Turret mining district, Chaffee County, Colorado                                      |

# New Beryllium Discoveries on Colorado's

Important additional occurrences of beryllium mineralization have been found on Badger Flats, Park County, Colorado by U. S. Beryllium Corporation, the largest United States producer of beryllium minerals.

A third beryllium mineral has been discovered in the Boomer and Red Skin mines' ore in association with beryl, BeO, and the fairly rare beryllium silicate, bertrandite,  $\text{Be}_4(\text{OH})_2\text{Si}_2\text{O}_7$ , in occurrence with abundant yellow muscovite. This new beryllium mineral—euclase,  $\text{BeHA1SiO}_5$ —assays up to 17.0 percent BeO.

These are the latest developments in the Lake George mining district of Park County, Colorado in the year since MINING WORLD published the first article in March 1960, pages 45 and 46, reviewing unusual occurrences of beryllium mineralization.

Total production by U. S. Beryllium—and this is almost exclusively from the Boomer mine—from 1956 through December 31, 1960, was 778 short tons averaging 8.0 percent BeO or higher, 336 tons of 5.0 percent, and 1,028 tons assaying between 2.0 and 4.0 percent. Value of ore sales from October 1956 to the end of 1960 total \$315,332.00 with stockpile ore estimated to be worth \$100,000. Most of these sales have been to the

United States government. The real production potential of the district has not been tested awaiting the demands of growing domestic consumption.

Of greatest importance to U. S. Beryllium—and for that matter to the mining industry as well as the final users of beryllium metal, alloys and chemical compounds—is the great success in the last two years in selling low grade ore.

Thus the ability to produce and sell substantial ton-nages of all grades including new types of beryllium ores, has been a most important factor to the company financially and has opened a new frontier for the mining industry. For years only clean and hand cobbled beryl crystals, normally assaying above 10.0 percent BeO, were saleable, and were the only ore of beryllium in the world.

The United States government has operated an ore buying station at Custer, South Dakota for a number of years and purchases beryl assaying 8.0 percent BeO and higher for a base price of \$40.00 per unit. This has been an important market for the high grade ore. The low grade as well as some high grade has been shipped to Mineral Concentrates & Chemical Company of Denver and Loveland, Colorado. This company operates a

## Boomer vein mined through

The Boomer vein is developed through two shafts, the 115-foot-deep inclined Boomer and the 219-foot Flor-man which is only 94 feet from the Boomer. Both shafts were sunk in the early 1900's in the search for silver, lead, and copper ore. Both shafts are equipped with gasoline hoists; the Boomer has a wood headframe while the headframe and ore bins at the Florman are of steel. Air for both mines is supplied by a 315 cubic foot Diesel-driven compressor.

The 50 foot level of the Boomer has been the most productive. Only 22 feet south of the shaft one massive pod of crystal beryl was mined to yield 100 tons of ore. Drifting on the vein has reached a length of 150 feet from the shaft, all in ore. Northwest of the high grade



**BLUE JAY** mine where the vertical shaft is now being deepened to new contact. Pikes Peak shows 40 miles east.



**BOOMER STOPE** where more than \$100,000 worth of beryl was mined. Harlan Foresyth, superintendent, is shown.

## Badger Flats

by **JESSE SIMMONS**

plan utilizing a patented process to yield beryllium oxide that is sold to Coors Porcelain Company of Golden, Colorado, for use in high temperature beryllium-ceramic materials. National Beryllia Company of Haskell, New Jersey, is another user.

U. S. Beryllium is half-owner of the Boomer, leases the other half, and operates the mine. It owns or controls about 40 claims in the immediate Boomer vicinity, leases the patented Redskin claim where the Redskin mine is situated, and holds 15 other claims in that area.

Mineral Concentrates & Chemical Company has purchased equipment for a 50-ton-per-day mill and is in the process of assembling it at the Boomer mine. The upgrading process has been developed by Mincon and will be used to treat readily available low grade material from the stockpile and developed in the mines.

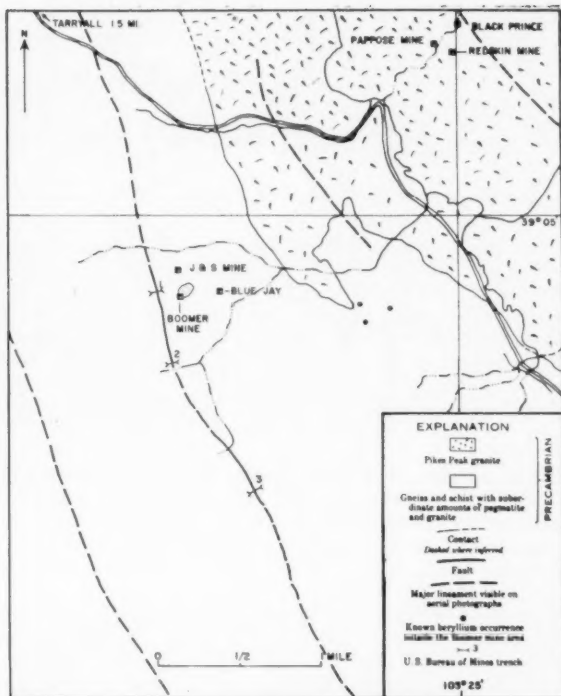
U. S. Beryllium has also purchased 20 claims in the Turret mining district near Salida, Colorado, on which a number of crystalline beryl bearing pegmatite dikes have been prospected.

### two shafts; start at Redskin

pod the vein contained a great deal of bertrandite and widened to an 11 foot width that assayed about 8.0 percent BeO. Beryllium ore has also been stoped on the 21, 70, and 105 foot levels. Several old stopes mined for silver and lead were backfilled with beryl ore. Backs of several stopes showed solid beryl from one to three feet in width.

Dewatering and cleaning out the old workings at the Florman have disclosed workings at 70, 93, and 114 foot levels, all containing beryl and bertrandite. More copper has been found than at the Boomer. Stoping has only started at the Florman.

Prospecting has disclosed beryllium mineralization at the J. & S., 1,000 feet to the north; on the 70 foot level



**GEOLOGICAL MAP** of the Boomer Flats district showing mines and their relations to faults and rock contacts.



**REDSKIN** mine which had been developed years ago for molybdenite. Ore is bertrandite and euclase in greisen.



**BOOMER MINE** with Florman shaft on left and Boomer incline on right. Dump in center assays about 3.0 percent BeO.

of the Blue Jay shaft 500 feet to the south, and at several places to the south of the Blue Jay.

Reopening of the old Redskin shaft sunk on a molybdenite prospect, two and one-half miles to the northeast

of the Boomer, disclosed bertrandite-bearing greisen in the shaft and on the 150 foot level.

## U. S. Geological Survey finds two types of ore bodies

Engineers and geologists from the United States Geological Survey and the U. S. Bureau of Mines have been active in the district for several years digging surface exploration trenches, sampling the various types of mineralization, and mapping surface and underground geology.

A preliminary report on the geology and mineralization in the district has been published as part of *Geological Survey Professional Paper 400-B*, Geological Survey Research 1960, by the United States Geological Survey. W. N. Sharp and C. C. Hawley of Denver, Colorado, are the authors.

Two general types of ore occurrence are reported. "High-temperature veinlike deposits, generally beryl bearing, are not uniform in appearance of composition. They range in character from poorly defined, highly altered complex veins within strongly greisenized zones to small simple quartz-beryl veins in unaltered granite or metamorphic rock. Most of the beryl ore produced from the mine has come from the veinlike deposits in greisen, near contacts between granite and metamorphic rocks. The beryl ore consists largely of intergrown green and white beryl crystals with interstitial quartz and

muscovite. Locally the beryl-bearing rock has been highly altered, and contains bertrandite, and possibly some hitherto unidentified beryllium minerals, in association with abundant yellow muscovite."

The second type of ore is "bertrandite-bearing greisen . . . a local variant of normal greisen in the Lake George district, and in at least one place it is sufficiently abundant to be ore. This is at the Boomer mine, in a small granite stock, and such rock occurs in at least one of several pipes in Redskin Gulch in the main Pikes Peak granite batholith, several miles to the east.

Bertrandite in greisen is an inconspicuous mineral, hard to distinguish from feldspar or stained quartz in hand specimens, and much of the the bertrandite-bearing greisen closely resembles normal greisen. At the Boomer mine, however, the bertrandite-bearing greisen appears to contain more fine-grained yellow muscovite than normal greisen, and locally at least it can be distinguished by its lighter color. The contact between the darker gray and the paler yellowish greisen is commonly sharp but irregular. But yellow muscovite cannot be used as a general criterion for bertrandite-bearing greisen, for it is a minor but widespread constituent of barren greisen as well. The bertrandite in the greisen forms pale flesh-colored crystalline aggregates and rounded grains evenly distributed through the rock; it is about equal in abundance to quartz and to muscovite."



**SURFACE OUTCROP** near the Redskin shaft carries high grade bertrandite ore. Old timers never heard of this mineral and to them it was valueless.

## Beryllometer locates non-crystalline beryllium minerals

The beryllium-detecting device, known as the "berylometer," has been of immeasurable value to the U. S. Beryllium Corporation for prospecting, as well as for assaying ore for shipment and the ordinary assaying necessary in a mining operation.

In the beryllometer the gamma rays produced by the isotope antimony 124 reduce ordinary beryllium,  $Be^9$  to  $Be^8$ , and a neutron is released. These neutrons are counted by an especially made scintillator. The beryllometer is positive in its action,

since no other element reacts to the antimony isotope, and a click on the scintillator indisputably means beryllium. Great credit is given the instrument for the splendid manner in which it discovered and delineated the beryllium ore in the Redskin mine.

Ore found in the old Redskin workings is being mined and exploration is under way in search of other ore bodies.

U. S. Beryllium Corporation plans further development of known occurrences in the area and will con-

tinue its search for unknown deposits.

Corporation officers are: Don H. Peaker, president and treasurer, Pueblo, Colorado; Charles S. Atwell, chairman of the board, Port Arthur, Texas; A. Allan Ladd, Jr., vice president, Pueblo; Dr. Willard D. Egolf, vice president, secretary, and general counsel, Washington, D. C.; and Francis D. Buser, assistant secretary and treasurer. Harlan H. Foresyth is mining superintendent. Other directors are Dr. A. Mc. Tipple and Frank P. Tallman of Pueblo, and Maurice C. Hill of New York, New York.





**CONCENTRATES** from two mines will be shipped to Iligan for refining as shown on map.



**NEW REFINERY** at Iligan will look like this when completed. In fact the new refinery would look like this at any spot on the Philippine coast. While Iligan has the advantage of readily available electric power it now looks like it might be further away from the geographical center of Island copper production. New developments on Luzon to the north indicate future shipping costs might be reduced by moving the refinery farther north. The numbers indicate key buildings:

1. Concentrate storage.
2. Leach and reduction building.
3. Metal powder storage.
4. Hydrogen production area.
5. Ammonia production area.
6. Copper wire, tube, and strip building.
7. Ammonium sulphate area.

## Copper Concentrates to Metal Shapes in Marinduque's New Philippine Plant Eliminates all smelting for first time by chemical leaching, gaseous reduction to powder, and use of new rolling techniques

When the Export-Import Bank of Washington, D. C. announced authorization of a \$13,000,000 credit to Marinduque Iron Mines Agents, Inc. it was the most important step in the fast-moving career of Jesus Cabarrus, Marinduque president.

The Philippine Islands have been a growing source of copper since the end of World War II, a great deal of it from Marinduque's two mines, but nearly all this copper was shipped to Japan for smelting and refining. Mr. Cabarrus knew that the Philippines needed copper wire for the expanding electric networks, needed copper strip and sheet for air-conditioning units, hardware, and other products, and needed other copper shapes for expanding industries. Nearly all this had to be imported.

Local production of copper metal shapes was a logical step to add to the mining and flotation operations already under way.

After Marinduque's engineers made a world-wide survey of copper refining and rolling operations, they determined that the conventional pyro and/or electrolytic smelting and refining processes would be uneconomic on

by **George O. Argall, Jr.** Editor

the relatively low tonnage of concentrates available and the present market potential.

Ammonia leaching and hydrogen reduction offered attractive possibilities and these were investigated. When it was learned that the E. W. Bliss Company had perfected a process to continuously convert copper powder to rolled shapes, a fully integrated plant looked feasible.

After considering a number of different proposals for refining and fabrication from United States, Japanese, and German engineering companies Marinduque decided in favor of Chemetals Corporation's proposal. Chemetals holds the world rights to ammonia pressure leaching and hydrogen reduction of copper from Canada's Sherritt Gordon Mines Limited, which developed the process for nickel refining with the technical aid of Frank A. Forward, University of British Columbia.

Under the terms of the Bank loan and the supplemental agreement with Marinduque, Chemetals will license to Marinduque the rights to use the process. Sherritt Gordon will provide technical personnel and

# This is Marinduque . . . The Men—The Mines—



Jesus S. Cabarrus

## Marinduque Iron Mines Agents, Inc.

Pilot Building, Manila  
United States office, 444 Market Street, San Francisco, California

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Jacob E. Cabarrus, vice president  
Dee K. Chiong, director  
Antonio Garcia, director

Jesus S. Cabarrus, president  
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J. A. Roco, consulting chemist  
C. Tiglao, general superintendent, Sipalay  
S. D. Macaranas, mine superintendent,  
Bagacay

D. M. Basco, chief geologist  
O. Lapid, construction engineer  
E. Buggarin, mill superintendent, Sipalay  
A. E. Soriano, chief engineer, Bagacay

### Ore Reserves and Grade

Bagacay: 2,915,947 metric tons, 3.55 percent copper and 5.0 percent zinc (Est.)  
Sipalay: 20,600,000 metric tons, 0.79 percent copper and 0.03 percent MoS<sub>2</sub> (Est.)

recommend final designs. Sherritt will also make large scale pilot runs at Fort Saskatchewan, Alberta, Canada on Sipalay and Bagacay mine concentrates for the purpose of training Marinduque engineers, and will provide detailed operating data for sizing of certain plant equipment. This is a most important phase as it will assure that all equipment will be properly sized with no bottlenecks when production starts early in 1963, provided plant completion is on schedule by the end of 1962. Marinduque's engineers will move to Canada to receive training so that they will be a nucleus for plant supervision and operation. Balancing of circuits is most important because Sherritt now has about twice the leach capacity originally anticipated, but proved unnecessary in actual plant operation. It is anticipated that chemists and other plant control personnel will work in and be trained at the Whitaker Metals Company plant at Kan-

sas City, Missouri.

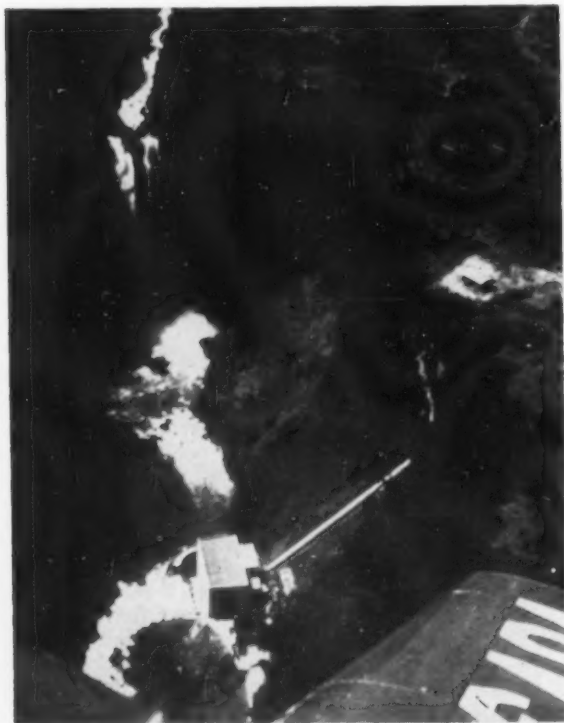
It is also expected that key United States and Canadian engineers will be loaned to Marinduque by design and contracting companies and sent to Iligan City for the first year of actual plant operation.

The plant will be designed to process two concentrates. Sipalay concentrate—35,000 tons per year assaying about 25.0 percent copper, 35.0 sulphur, 30.0 iron, and 10.0 insolubles. Copper is chalcopyrite. Bagacay concentrate—40,000 tons per year—should assay 14.5 percent copper, 15.5 zinc, 29.0 iron, and 41.0 sulphur. Copper is chalcopyrite and a small amount of covellite. Zinc is sphalerite. Plant output should be about 14,000 annual tons of fabricated copper products and about 100,000 tons of ammonium sulphate fertilizer. At a future date the plant may be expanded to yield either lead-free zinc oxide or electrolytic zinc (from the bulk copper-zinc Bagacay flotation concentrate).

The new plant is expected to cost \$23,000,000, which is 40 percent less than conventional smelting, refining, casting, and rolling plants having the same tonnage. Operating cost of new plant is expected to be about five cents per pound, which is about one half the cost of converting to strip by other methods.

### Process highlights

1. Concentrates will be pulped with recycled aqueous ammonia and wash solution.
2. Pulped concentrates will be leached with ammonia and air at 225° F. temperature and 125 pounds per square inch pressure.
3. Leached concentrate and solution will be separated in thickeners. Residue (underflow) will be washed and wash water recycled.
4. Washed residue will be floated to separate unleached pyrite. Flotation tailing will be discarded.
5. Thickeners overflow, (pregnant solution) containing copper, zinc, sulphur, and ammonia will be pumped to top of distillation column.
6. Recovered ammonia will be recycled and the pregnant solution pumped through preheater into oxidation-hydrolysis towers.
7. Solution will be oxidized with air at 475° F. temperature and 700 pounds per square inch pressure. Ammonium sulphate will be precipitated.
8. Solution will be cooled and slurry pumped into a pressure filter. Filter cake will be recycled to leaching stage.
9. Clarified pregnant solution will be stored in heated tanks.



CHEAP POWER is key to Iligan site. Maria Christina falls and hydroelectric plant assure adequate immediate power.

# The Plant Contractors

## Prime Contractor

Foster Wheeling Corporation  
B. L. Denker, general manager engineering and construction division  
666 Fifth Avenue, New York 19, New York

## Technical Advisor and World Licensee

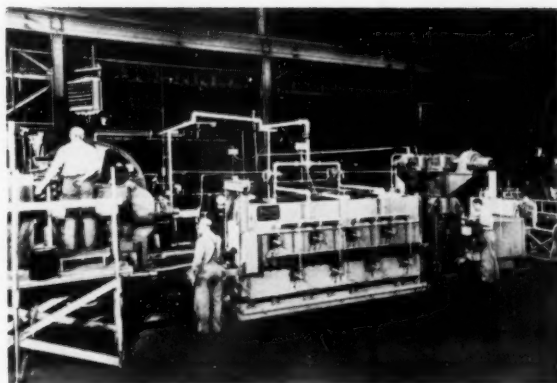
Chemetals Corporation  
Dennis Pickens, president  
380 Madison Avenue, New York, New York

## Patent Holder and Technical Training Company

Sherritt Gordon Mines Limited  
Eldon Brown, president  
25 King Street West, Toronto, Ontario, Canada

## Rolling and Fabricating Equipment

E. W. Bliss, Company  
George Perrault, executive vice president  
Salem, Ohio



**COPPER POWDER** to metal strip machine to be used at Iligan. Powder feeds from hopper, at left, to compacting rolls, then to sintering furnace, and through hot mill rolls.

10. Sulphuric acid will be added to lower the free ammonia.

11. Solution will be pumped to autoclaves which will operate at a 500 pound per square inch pressure and a 375° F. temperature.

12. Hydrogen gas will be pumped into autoclaves in stages. Reduction will be continued until the solution is essentially free of copper.

13. Copper powder will be separated from solution and washed and repulped with sulphuric acid.

14. Copper powder will then be washed with water and filtered on a vacuum pan filter.

15. Copper powder from filter will be dried in reduction atmosphere in an electric furnace.

16. Copper powder will be pulverized and screened to minus-100-mesh.

17. The copper powder will be fed to compacting rolls, to a sintering furnace, a hot roll, a short annealing furnace, and another roll. See photograph.

18. The rolled copper can then be sent to a variety of rollers, slitters, cutters, and trimmers to make a variety of strip.

19. Machinery for converting strip into tubing will be installed.

20. Zinc will be recovered as zinc carbonate by adding carbon dioxide to reduction end solution. This can be acidized for electrolytic treatment.

A sulphuric acid plant burning pyrite recovered as a byproduct outlined above will be included so that sulphuric acid will be available for use.

High pressure steam will be generated by burning oil.

Hydrogen gas will be produced in an electrolytic plant using hydroelectric power from Maria Christina.

## Cheap power at Iligan

The plant site was selected at Iligan because it is close to the Philippine government's Maria Christina hydroelectric plant. See photograph. This power plant has an installed generation capacity of 50,000 kilowatts. The connected load has totaled 31,600 as follows: 23,000 for the government's ammonium sulphate fertilizer plant, operated for several years and recently sold to a private firm; 4,000 to the government's NASSCO steel mill which melts scrap in electric furnaces; 4,000 for the carbide (occasional ferroalloy) plant using an electric furnace; and 600 kilowatts to Iligan City for lighting and small power requirements.

It has been estimated that maximum power demand for the new plant, if and when an electrolytic zinc circuit has been added, will be 8,000 kilowatts.

The hydroelectric plant always has an excess of falling water and is close to the proposed plant site on the beach so that power line construction will be very low.

While there is no deep water harbor at Iligan City, or along the beach to the west where the plant will be built, there will be no problem in anchoring inter-island steamers offshore at the end of a long conveyor belt pier. See picture.

This new plant is most important in the industrialization of the Philippines, which has long exported its minerals only to have them refined and fabricated abroad for import at a high price.

Marinduque, long a pioneer in Philippine mine development, now becomes a world-wide pioneer in complex metallurgical refining. It could well set the pace for similar plants to convert local concentrates to finished metal shapes in other parts of the world. END



**ILIGAN INDUSTRIAL** row along sea coast based on cheap power. Copper will join steel, fertilizer, and carbide.



**BIG BIT** is pulled out of shaft. Drilling face shows 28 Hughes rolling cutters in seven stages. Stinger bit has been uncoupled.



**KERR-McGEE'S** No. 7 rig, medium size by oil well standards, has 135-foot-high Lee C. Moore derrick.

# How Kerr-McGee Drilled 90-Inch

by P. A. Wolff, chief engineer, Kerr-McGee Oil Industries, Inc. and  
R. K. Pertile, chief mining engineer, Kermac Nuclear Fuels Corporation

The application of large scale rotary drilling equipment for shaft sinking has just moved forward another step as Kerr-McGee Oil Industries, Inc. completed its 90-inch Section 24 shaft recently. This 710 foot deep shaft was drilled and lined with a 72 inch diameter inside steel shaft liner just 45 days after drilling started at Kermac Nuclear Fuels Corporation's New Mexico uranium mine.

This was the fifth and largest shaft sunk by rotary drilling for Kermac Nuclear during 1960. The shaft will be used initially for ventilation with provision for use as an escapeway at a later date. The four previous shafts are 44 inches in diameter and were sunk to depths from 541 to 882 feet; actual drilling time ranged from nine to 21 days.

The use of small diameter drilled shafts for ventilation and escapeways has been particularly effective in the Ambrosia Lake District; the ore bodies (with multiple horizons and

trends) are relatively small and widely scattered and do not lend themselves to simple, consolidated ventilation systems. In addition to normal problems associated with mine ventilation, radon gas exposure must be controlled by moving large quantities of air through each working place and mined out areas must be sealed off. In general, the ventilation practice has been to introduce fresh air through 36- and 44-inch

shafts as close to the mining areas as possible, and exhausting through the main shaft and ventilation holes behind the mining front. In keeping with development progress and to provide optimum ventilation at Section 24 mine, an additional 150,000 cubic feet per minute of air was required.

Several methods of providing the additional air were evaluated. Three 36- or 44-inch holes would deliver such capacity, but the horsepower requirements and the resultant power cost plus the cost of three such holes

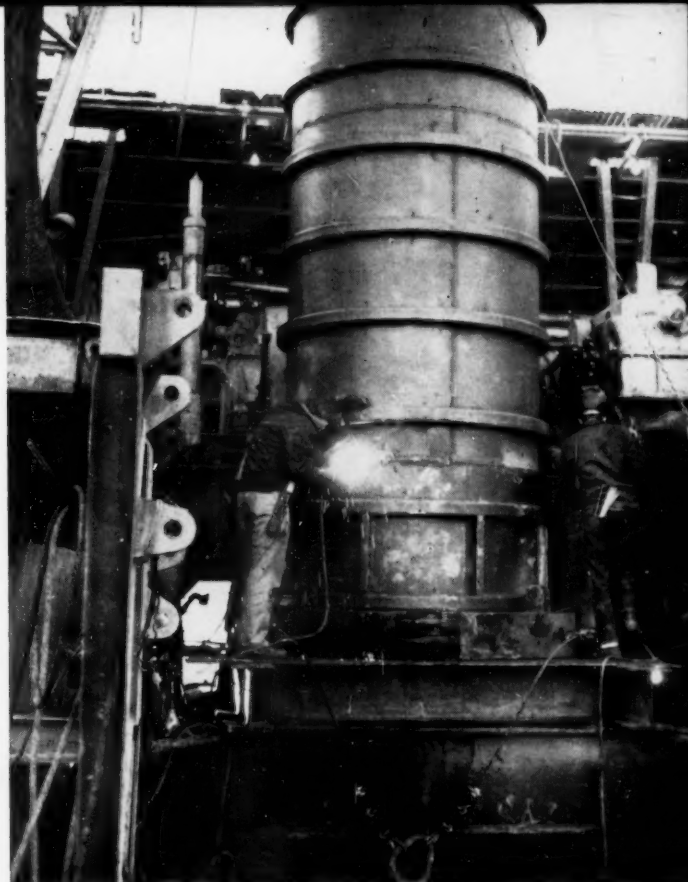
## Rotary-drilling of shafts has advantages in

Material advantages are offered by rotary drilling methods. A shaft can be sunk and lined without personnel ever entering the shaft, thereby eliminating exposure to shaft sinking hazards. Completion time is greatly reduced, and temporary headframes, hoisting and muck handling equipment are eliminated. Shaft walls are not exposed to blasting and

consequent fracturing; and, since the hole is filled with mud until casing is set, no air slacking can take place. Problems associated with formation water in conventional shaft sinking are minimized in the rotary method. The head of drilling fluid counteracts the head of water in the formation. The drilling fluid cakes the walls of the bore hole, sealing it off



**LOWERING THE 90-INCH** diameter bit into shaft. Note drilling mud filling the shaft to top of cellar.



**WELDING LAST JOINT** on the string of 72-inch inside diameter casing. Special stiffener rings to give added rigidity are shown.

# Ambrosia Lake Ventilation Shaft

compared unfavorably with one shaft having a large cross sectional area. Conventional raising or sinking was considered; however, the time required was excessive and would have delayed stope development and achievement of optimum ventilation. Drilling and casing a large diameter shaft required much less time, allowed completion of the shaft well ahead of the tracked haulage drifts and will provide maximum ventilation for development and stoping upon intersection of the shaft from the haulage drift.

## soft formations—safety, speed, sealing off formation water

from loss of fluid and supporting it against sluffing. Actual design of shaft liner is dependent upon ground and water conditions. Steel casings of various wall thicknesses, with or without stiffening, may be set and may be concreted or grouted in; or if so desired, any zone may be grouted or concreted off. A further advantage is that a steel casing complete

### TIME LOG FOR DRILLING AND SUMMARY OF EQUIPMENT PERFORMANCE

- The 15-inch pilot hole was spudded on November 23, 1960.
- The 90-inch shaft was spudded on November 27, 1960.
- The 90-inch shaft was completed to a total depth of 710 feet on December 30, 1960.
- Steel casing (lining), 72 inches inside and 78½ inches outside diameter, was landed on January 1, 1961.
- The shaft was drilled with a circulation rate that averaged between 7,500 and 8,000 gallons per minute. This was possible by using the large pump and the fluid circulating system (standpipe, swivel, hose, Kelly, drill pipe, collars, and bit) that had a minimum 12-inch inside diameter for fluid passage.
- The average drilling rate was in excess of two feet per hour.
- Rotation speed was 12 revolutions per minute.
- Drilling weight was as high as 50 tons.
- Total drill string weight was 80 tons.
- Excavated volume for the complete shaft was equivalent to a 40,000-foot-deep 12-inch hole.

with all shaft hardware, dividers, etc., may be set. It is also possible to construct a concrete lining in place from the top down, by use of vertically moveable forms. In this method, the fluid previously used for drilling is maintained at a level below the forms.

Vertical alignment of the shaft is a function of the care and technique

used in drilling and reaming the pilot hole. Improved techniques now make possible large diameter rotary-drilled holes to the required vertical alignment.

Kerr-McGee's No. 7 is now drilling a 1,500 foot shaft in another district. Plans for shafts 8, 12, and 14 feet in diameter are under consideration.

**Continued overleaf**



**KERR-McGEE** crew at No. 7 includes Jim Bawcom, engineer; Charles Cowell, day driller; and Jack Patton, tool pusher.

## Use special bit, kelly, swivel,

The drill rig was Kerr-McGee rig No. 7, which is built around a National 75 drawworks; a Lee C. Moore 133-foot, 620,000-pound A.P.I. capacity, jackknife mast; an Ideco 23-inch rotary table; and two 400-horsepower Waukesha LRO engines. The Lee C. Moore nine-foot substructure was modified to allow passage of the 90-inch bit and the front of the substructure was made removable for running the 78½-inch outside diameter casing. Rig No. 7 is rated as a 10,000-foot rig in oil well drilling and by oil field standards is medium sized.

The tool string consisted of a 90-inch diameter bit equipped with 28 Hughes SCS soft formation cutters in seven concentric stepped rings.

Immediately above the bit were three 40-inch O.D., 42,000-pound flanged-end lead-filled drill collars, each 8 feet 10 inches long, and a 13⅜-inch crossover sub.

Drill pipe, 27 joints, was 13⅜-inch O.D. splined pipe with special Hughes H-90 thread tool joints.

The 42-foot kelly was 12-inch I.D. bushed to fit the

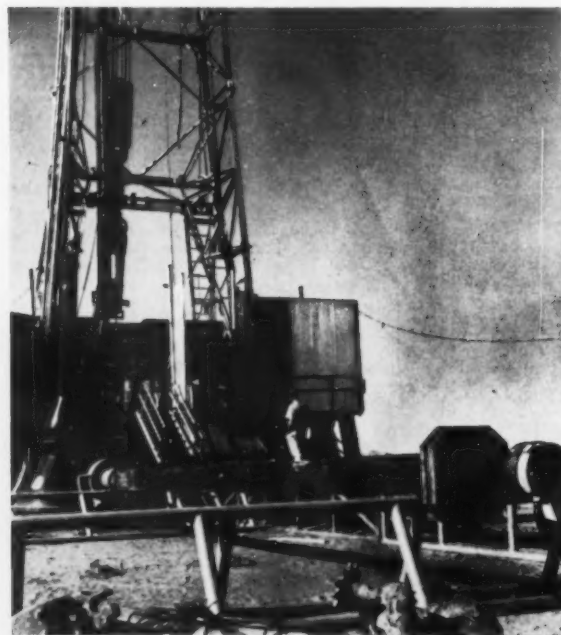
## Drill 15-inch pilot hole and ream to 90-inches in one pass using

A 15-inch pilot hole was drilled to 751 feet using a Hughes tri-cone bit and the rig's conventional 7¼ by 18 inch Oilwell pump. A limit of one-half of one degree deviation was specified, and was held to by the drillers; vertical alignment surveys were run every 30 feet and a directional

survey was run at the completion of the pilot hole. The additional depth of the pilot hole was to provide a trash pit for any lost steel.

The pilot hole was then reamed to 90 inches using the rolling cutter bit equipped with a short 15-inch Tri-cone stinger. Drilling weights varied

from 40,000 pounds to 100,000 pounds depending on the formation; rotary table speeds averaged 12 revolutions per minute. The entire tool string was pulled every 18 to 24 hours to inspect the string and bit; cutters were inspected and changed with the string in the derrick. No dif-



**SPECIAL SQUARE** Hugh B. Williams 14-inch Kelly used for large drill string. Note bit body on ground at left.

## Steel casing stiffened with stand a collapse pressure of

The steel casing is a 712-foot string of ¼-inch wall thickness 72-inch I.D. pipe with 3 by 4 by ¼ inch channel external stiffener rings spaced on 24-inch centers. Maximum outside diameter at the stiffener rings is 78½ inches. The casing was made up in 32-foot joints, and welded together as the string was run into the hole. Special Williams 73¼-inch double elevators were used to handle the casing and 33 hours were required to set casing.

As part of Kerr-McGee's integrated contracting and engineering service, the casing and installation were designed by company engineers. The casing is supported from the top, having been cemented into the shaft collar. The annulus was not cemented below 40 feet. Since the water table is 350 feet above the shaft bottom, windows were cut every 32 feet to prevent the building up of substantial hydrostatic heads; however, the casing must withstand the external pressure caused, in time, by sluffing formations, squeezing shales, and trapped water. It has been found by experience that a design collapse pressure of 130 pounds per square inch is sufficient to withstand these rather unpredictable loads for non-water-tight casing in the Ambrosia Lake area.

For the previous ventilation shafts of 40-inch outside diameter the desirable resistance to collapse was obtained with single shell unstiffened casings with a one-

## drill collars, and standpipe

23-inch rotary table; the swivel was 12-inch I.D., 400,000-pound rating, with SKF roller thrust bearings. The swivel was connected to the 12-inch I.D., 40-foot standpipe with 50 feet of 12-inch I.D., U. S. Rubber Company rotary hose. This hose is one of the largest of its type ever manufactured.

The mud pump was a rubber lined 12- by 14-inch Allen-Sherman-Hoff materials-handling centrifugal rated at 7,000 gallons per minute at a discharge head of 110 feet, and is of the same type used for booster pumps in sand-frac operations. Up to 8,000 gallons per minute were obtained during drilling. The pump was equipped with a 14-inch O.D. suction and 12-inch discharge. A 350-horsepower Cummins LRT6 Diesel was used to drive the pump.

The special tool string and pump were supplied by the Hugh B. Williams Company, Dallas, Texas, one of the pioneers in development of tools and techniques for drilling large diameter holes.



**CUTTER TEETH** are checked on big bit by Paul Wolff, Kerr-McGee's chief engineer, and Jack Patton, tool pusher.

### Formations drilled were relatively soft as follows:

Feet	Depth	Name and Description
0	70	Alluvium—top soil and blow sand
70	315	Mancos—(Km) primarily carbonaceous shale with intermittent thin sandstone stringers
315	392	Dakota sandstone—(Kd) interbedded with sandstone and shale
392	510	Brushy Basin Jmbb—green bentonite shale
510	710	Westwater sandstone—(Jmww) medium grained, unconsolidated sandstone with interbedded bentonitic mudstone

## up to 100,000 pounds of weight on roller cutter bit

difficulty was experienced in any of the formations other than the balling-up of the bit in the Brushy Basin shale and the loss of circulation of drilling fluid in the Westwater sandstone. The bit was pulled twice to clean off the shale packed around the cutters and nozzles. Circulation was re-

gained by increasing the velocity of the drill fluid and by the addition of cotton seed hulls. Drilling mud was supplied by the Baroid Division of National Lead Company. Mud weight approximated 9½ pounds per gallon with a viscosity of 35 to 40

seconds using Aquagel.

Since this was the first large diameter hole drilled by Kerr-McGee, considerable time was spent experimenting with various drilling weights and rotary speeds, including frequent bit inspections and equipment checks.

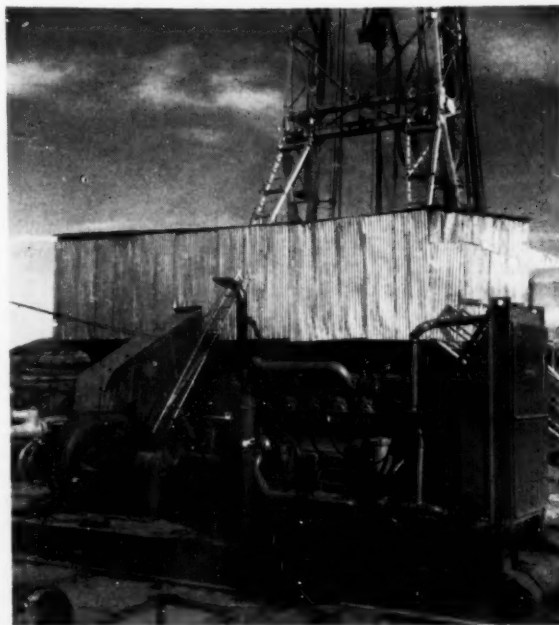
## welded steel channels to withstand 220 pounds per square inch

half-inch wall. These casings weigh 150,000 pounds. A single-shell casing of 72-inch inside diameter having the same collapse strength would have a wall thickness of nearly one inch and would weigh 510,000 pounds. The casing used has an external collapse pressure of 220 pounds per square inch and weighs 196,000 pounds. The stiffener size and spacing was chosen to give the shell elastic stability for uniform external compressive loads up to the yield point of the shell steel.

Fabrication of the casing was by Grants Pipe and Tank Company, Grants, New Mexico. Each stiffener ring was formed in thirds in a hydraulic press by Commercial Shearing and Stamping Company, Salt Lake City, Utah.

Two Joy 45—26½—1750 revolutions per minute two-stage series 1000 Axivane fans operating at 125 horsepower each, will be installed on the shaft casing with 30° "Y" type mounting. The total downcast air volume through this shaft will be 150,000 cubic feet per minute, at a static head of 7 inches of water. A pressure drop of 4 inches of water will be lost as casing and elbow friction, leaving 3 inches for the mine and returns. The total ventilation system will utilize some of the smaller vent shafts fitted with supply fans; other smaller vent shafts fitted with up-cast fans and the mine shaft will handle the exhaust air.

END



**RUBBER-LINED** Allen-Sherman-Hoff centrifugal pump driven by 350 horsepower Cummins Diesel used for mud circulation.



**ELECTRIC DUMP** truck uses electric power from overhead trolley installation to run 400 hp, direct current LeTourneau

electric motors contained in hubs of each wheel. Tires float truck so that spring suspension is not necessary.

## Will This 75-Ton Electric Truck Revolutionize Open Pit Haulage?

Can you visualize an open pit mine having haulage roads with grades up to 15 percent? With 60-, 75-, and 100-ton capacity trucks speeding ore out of the pit at 10 to 20 miles per hour? Can you foresee your present truck maintenance costs cut in half? This is the future potential for open pit truck haulage. And this rosy picture is closer than you think!

In April 1960, The Anaconda Company put into operation at Butte, Montana, an electric truck that has greater power and promises superior performance over present-day conventional Diesel models. This electric wheel truck is now being used in the Berkeley pit for hauling up to 75 tons of material up a 15 percent adverse grade at a speed of 12 miles per hour! This is about double the speed possible with conventional Diesel haulage on the same grade. With power supplied through a trolley to 400 horsepower electric motors in each wheel, there is no need for heavy, cumbersome torque converters, clutches, transmissions, and differentials. Thus, high maintenance costs common with these intricate

mechanisms are completely eliminated.

### Anaconda developed idea in 1958

The concept of an electric wheel truck for open pit mine haulage was conceived by the mining research department of The Anaconda Company in 1958. At that time motorized electric wheels (see *MINING WORLD*, January 1960) had been developed and perfected by both the General Electric Company and R. G. LeTourneau Incorporated. However, this new power concept was only being experimentally used by the military and heavy construction industries. The mining industry had not yet taken advantage of this revolutionary development. However, Anaconda engineers knew that an electrically operated, trolley-battery truck haulage system was successfully operating in the mine of the International Salt Company at Dearborn, Michigan. They also knew of the good performance records made at the Riverside Cement Company in California by three special Kenworth trucks that were equipped with Gen-

eral Electric direct current traction motors instead of the usual Diesel engines. Thus, when Anaconda decided to develop an electric truck, it was logical for them to combine the best qualities of known concepts in their own version. The result is the TR-60 trolley-dump truck that is the joint effort of The Anaconda Company and R. G. LeTourneau Incorporated of Longview, Texas.

### Truck also has diesel power

The TR-60 electric dump truck is a highly maneuverable, four-wheel giant using electric power from an overhead trolley installation to run motors contained in the hubs of each wheel. Each wheel hub contains a 400 horsepower, 600-volt, direct current LeTourneau electric motor. The truck is equipped with a Diesel engine to supply power to the wheel motors when it is away from the trolley power source—usually in the loading and dumping areas. This 335 horsepower Diesel engine also supplies alternating current at all times for dumping, steering, and braking. Accordingly, the Diesel is operated





**TRUCK** hauls up to 75 tons of Berkeley pit waste up a 15 percent adverse grade at a speed of 12 miles per hour—about double the speed of Diesel haulage.

continually at a constant speed and is coupled directly to the alternating and direct current generators.

To quickly raise the dump box of the truck, a special 130 horsepower alternating current motor is attached to the truck body and geared through a reduction to a large toothed pinion. Steering control is by a small alternating current motor driving an arch-shaped rack and pinion of a wagon-wheel type steering system. Braking for operational purposes is by dynamic electric brakes in which generated power is dissipated as heat

through resistors. For emergency stops and parking there are magnetically controlled multiple disk brakes.

Large 48-ply, 89-inch outside diameter tubeless tires float the truck in such a manner that spring suspension is not necessary. Good traction on soft muddy roads is easily maintained. Tire wear from acceleration and deceleration is reduced to a minimum due to the very gradual acceleration possible with direct current motor drive, and the gradual deceleration possible with dynamic or re-

sistance braking. Tire wear due to "wheel spinning" is completely eliminated since power applied to the wheel motors goes only to the wheels having traction.

#### Trolley hookup is automatic

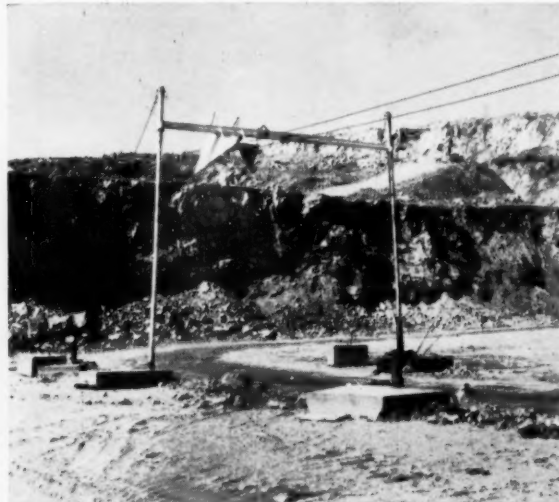
The TR-60 is being used in the Berkeley pit to haul up to 75 tons of waste from the upper levels of the pit to the waste dump. The truck has been used on a special roadway having an adverse grade of 15 percent. This haulage road, from shovel to dumping site, is approximately 2,428 feet long, of which 1,178 feet in the middle is equipped with an overhead trolley installation. The trolley system consists of some 40 portable towers spaced from 30 to 50 feet apart. The towers are lengths of six-inch steel pipe imbedded in heavy blocks of concrete that can easily be shifted by a fork lift truck.

From the loading shovel, where the truck uses its Diesel engine to power the electric wheels, it makes an approximate 600 foot run to the automatic trolley hookup. Here, a unique three-dimensional "W" shaped metal can on overhead trolley wires catches and guides the trolley poles of the slowly moving vehicle onto the power lines. Once connected to the overhead power source the truck speeds uphill 1,178 feet at 12 miles per hour to the end of the trolley line. Here, at the end of the overhead power source, the two trolley wires are elevated out of reach of the truck's trolley poles and the truck automatically reverts to Diesel power as it goes on some 375 feet to the dumping area.

A preliminary performance study shows that the loaded TR-60 has



**DIESEL ENGINE** supplies power to wheel motors when truck is away from trolley power at loading and dumping areas.



**TROLLEY HOOKUP** is automatic as unique metal can catches and guides trolley poles onto overhead power lines.

## Here are the details on Anaconda's electric truck . . .

### GENERAL SPECIFICATIONS

Overall length	45 feet 10 inches
Maximum height	16 feet 7 inches
Overall width	14 feet 7 inches
Wheelbase	26 feet 10 inches
Turning radius	40 feet
Ground clearance (minimum)	18 inches
Tires	89-inch outside diameter 48-ply—tubeless
Weight	112,000 pounds
Travel speed	infinite range from 0 to 20 miles per hour

### DUMP BODY

Length	26 feet 3 inches
Width	14 feet 7 inches
Height (loading height)	11 feet 6 inches
Dumping angle (maximum)	67 degrees

### CAPACITY

Struck	40 cubic yards
Heaped 3 to 1	50 cubic yards
Heaped 2 to 1	60 cubic yards

### MECHANICAL

Main power source	Trolley operated from 600-volt direct current outside power source.
Auxiliary power source	Two 335 horsepower Cummins Diesel engines direct coupled to LeTourneau AC and DC generators.
Power application	LeTourneau electric motors and gear boxes located at all points of power application, including DC motors in each wheel to provide additional drive.
Steering	Front axle electrically steered.
Brakes	Dynamic electric braking for operational purposes; magnetically controlled multiple disc brakes for emergency stops and parking.

been making the above run in a little over three minutes. The average travel time is broken down as follows:

	Minutes
Shovel to trolley hookup	0.55
Up to 7.1 percent grade (361 feet)	0.76
Up 15 percent grade (817 feet)	1.04
End of trolley line to dump point	0.77
<b>AVERAGE TIME</b>	<b>3.12</b>

Backing up to dump and dumping takes an average of 1.04 minutes. The return trip to the shovel (down grade) takes an average of 3.09 minutes. Loading at the shovel (with a

6-yard dipper) should take 1.82 minutes. Total round-trip time is approximately 9.07 minutes. Thus, the truck will make about 6.62 round trips per hour. Figuring an average payload of 65 tons, the TR-60 theoretically hauls about 430 tons an hour or approximately 3,227 tons per 7½ hour shift. This type of performance is far superior to any Diesel haulage now available, and is being done at a lower per-ton cost. Detailed cost and performance studies are still being conducted by the Anaconda Mining Research Department,

and many improvements are still possible. Notable among these are: (1) increasing the shovel and dipper size to 10 or 12 cubic yards; (2) increasing Diesel engine size for greater speed in the loading and dumping areas; and (3) extending the trolley line to make greater use of the more efficient power source.

Since the above performance statistics were made, the TR-60 has had a second 335 horsepower Cummins Turbodiesel engine installed in parallel with the first. The truck, when changes are completed, will be tested on longer hauls, particularly to check performance on long horizontal runs loaded and off trolley.

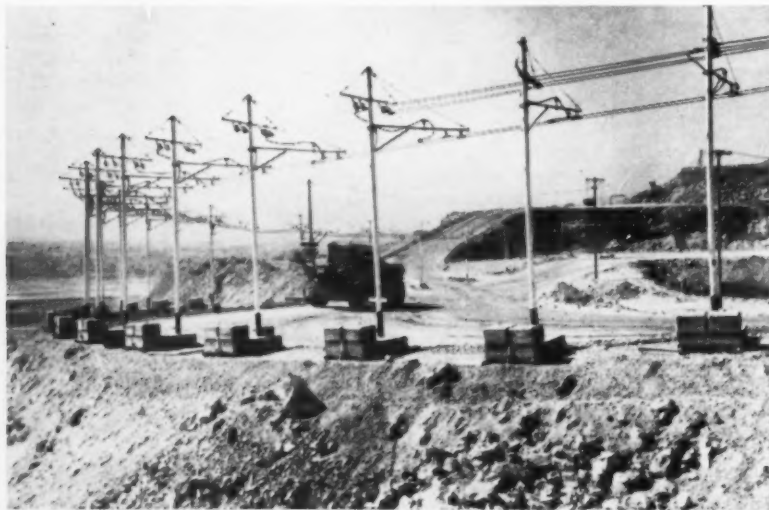
### Advantages to future mining

While the ultimate performance potential of the electric wheel truck is not known, it is easy to imagine the profound effect it will have on open pit mining and future pit design. Instead of long slow hauls up gently spiralling pit roads, electric trucks will go up steeper grades at ever faster speeds. This will reduce haulage distances and save considerable time. Also, since haulage roads could be laid out on straighter lines with steeper grades, pits would be able to conform more to the natural shape of the ore bodies. This would reduce the stripping ratio which, with present Diesel equipment, often has to be quite high to allow for practical grades on haulage roads. Maintenance on electric trucks would be considerably less than on conventional Diesel trucks due to the absence of intricate reduction mechanisms—torque converters, transmissions, clutches, differentials, etc. Although not known to an exact degree, there is also the definite saving in energy cost, plus reduction in labor cost due to the higher general performance rate of the vehicle.

All new equipment that has advantages also has some disadvantages. With electric wheel haulage these include: (1) inflexibility. Although the electric towers of the trolley installation are portable, the system must be in a special location, and is not as flexible or as quickly adaptable to day-by-day changing conditions as a fleet of Diesel trucks. (2) Vulnerability. The trolley system is vulnerable to damage by fly rock from blasting, or other accidents that would knock the entire system out of operation until repairs are made.

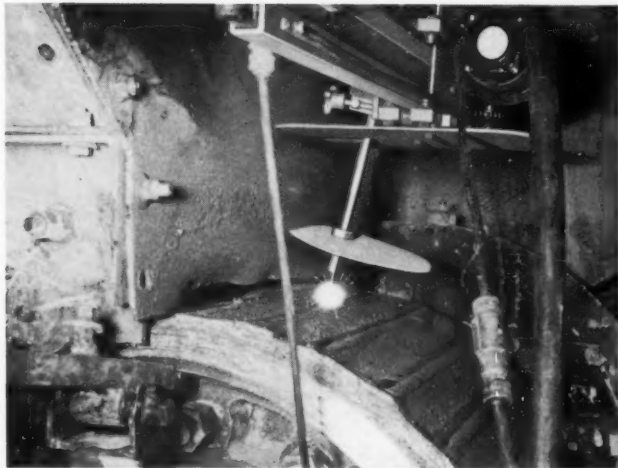
The capabilities and advantages of the TR-60 truck are still being developed by The Anaconda Company, which is considering its application at the Cananea and Chuquicamata open pits.

END



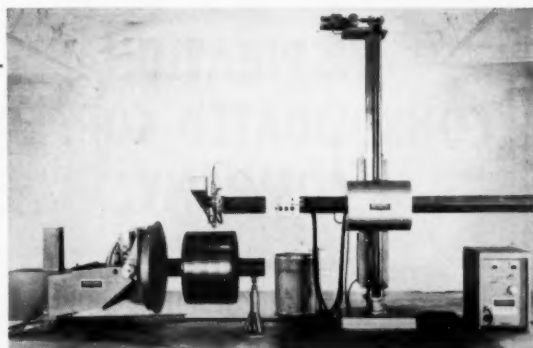
**OVERHEAD** trolley installation is flexible and can easily be moved to any section of the Berkeley pit. Truck is equipped with dynamic electric brakes.

# Announcing **3** NEW STOODY Automatic Welding Systems!

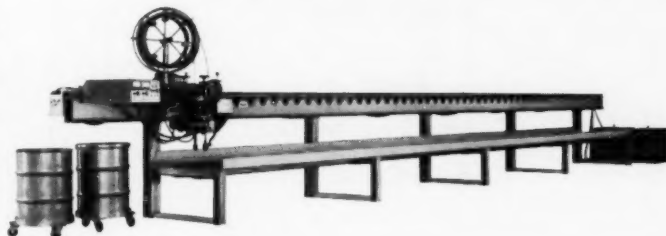


**1** **STOODY CRUSHERMATIC**—A compact, versatile system for automatically rebuilding and hard-facing crusher rolls in position. It enables the welder to work outside the crusher chassis in comfort and clean air. The Crushermatic consists of a motorized carriage riding a track which is suspended over the crusher roll. Wire is supplied to the carriage by any standard semi-automatic wire feeding unit. Uses a 400 amp power supply but 600 amps are preferable. Versatile electronic controls provide proper sequencing for a variety of circumferential and transverse welding patterns. The Crushermatic is portable by one man and is slipped into permanently welded brackets when in use. It deposits up to 20 lbs. per hour—300% to 400% faster than manual welding and 200% faster than hand-held semi-automatic welding.

**2** **STOODY MODEL U W UNIVERSAL AUTOMATIC WELDER**—The Model U W provides a complete welding system capable of cylindrical, conical and straight line welding. The 3000 lb. capacity positioner tilts the workpiece through a 120° angle and is equipped with power elevation and thyatron controlled rotation. All electrical controls are unitized in a portable control panel for maximum operator convenience. Ram type manipulator has a vertical travel from 6" to 8'-6"; Horizontal travel: 10'; Travel speed range: 5 imp to approximately 60 ipm. Manipulator mast rotates through 360°. Power source: DC, constant potential selenium rectifier type. Input: 220-440 V, Output: 500 amps at 40 V 100% duty cycle. 5 point slope control.



**3** **STOODY MODEL T L DUAL-HEAD TRACK LINK WELDER**—Provides dual welding heads with wires supplied from twin Payoffpaks for fast, efficient rebuilding and hard-facing. Extremely rugged construction. Features: Special gear-type wire feed rolls; positive high frequency starters; wider, lower bed for easier accessibility and greater capacity; heavy-duty double worm reduction gear box with DC variable speed travel drive motor. Unitized control panel. Bed length 40'; Bed width 46"; Bed height only 24"; Power: 2-500 amp constant voltage 100% duty cycle 220-440 V power sources.



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## Will Creede's time of faulting—an ore clue—work in other camps too?

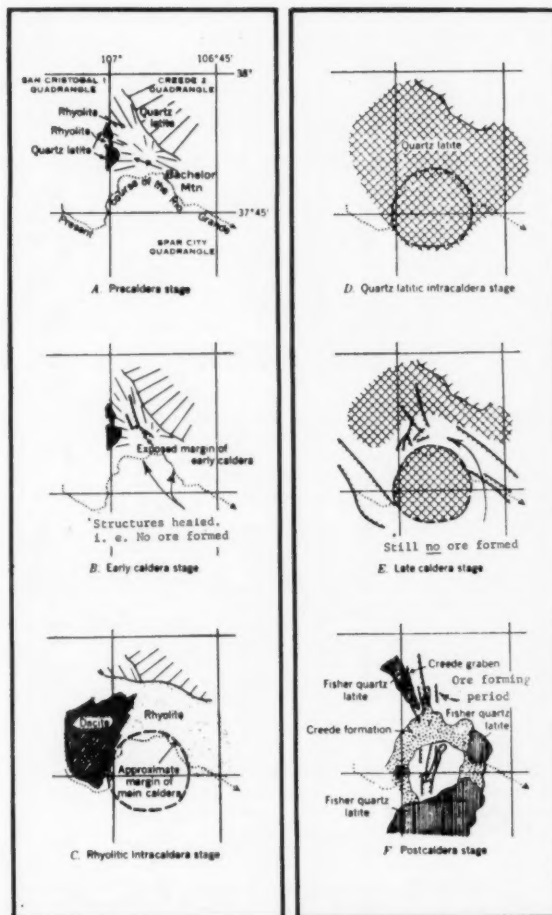
We have noted the laudable objectives of the United States Geological Survey's annual progress reports, started in 1960 with **Professional Paper No. 400**. Seldom does the Survey so flatly state "here is a good place to prospect" as do Geologists Steven and Ratté in summarizing the new look of geology around Creede, Colorado. This famous camp of the 1890's has already produced about \$60,000,000 and is still going strong. Although many mines contributed to the total, among them the Alpha, Corsair, Monon, Equity, Outlet, Solomon, Holy Moses, and Monte Carlo, the really great production came from just one structure, the Amethyst Fault zone, with its list of early producers—the Bachelor, Commodore, Last Chance, Happy Thought, Amethyst, P. & E., and Park Regent. Just one structure, that is, until the Emperius Mining Company found a related structure in the Amethyst hanging wall from which it has been producing for nearly 20 years.

Creede ore deposits are Tertiary, epithermal, polymetallic fissure vein fillings, with strong vertical zoning and a long strike length. An altered rhyolite, locally called porphyry, was formed by mineralizing solutions as a cap over most ore bodies. This accounts in part for the delay in discovery of the bonanza areas, and in whole for the location in recent years of the "new vein" of the Emperius Mining Company. The cap rock concealed much primary silver ore that changed downward to lead-zinc ore enclosed in pyritic and silicified walls. At greater depth, the rocks ceased to be altered, the metal content less constant.

Now the United State Geological Survey finds that mineralization can be closely related to a particular TIME of faulting and that the major deposits are associated with the reopening of the deep-seated, long-lived, earlier fault structures. This new work—six years of it—when published in detail, can be expected to offer several guides to those faults whose timetables should make them good targets for prospecting.

The Amethyst Fault zone marks major movement, both early and late, on one side of a down-dropped block. Now there almost has to be another upper side to the block and the Survey finds it along the Bulldog Mountain Fault zone where inferable early faulting and recognizable late faulting intensely alter rocks and some veining suggests, in the words of Stevens and Ratté on page B-17 "The Bulldog Mountain Fault zone appears to be the most favorable to prospect in the Creede district. Prospecting to date has been confined to near-surface formations which are underlain by soft tuffs which may have inhibited passage of mineralizing solutions. Important ore bodies are more likely to be found at depth for the rocks are the hard rhyolites that enclose the ore bodies on the Amethyst."

Of course it is entirely possible that no metals were ever deposited in the Bulldog Mountain Fault zone but



**STAGES WHEN** the Creede ore was formed. **GEOLOGICAL STAGES** in history of the district.

modern geophysical and geochemical methods, backed up by physical exploration, can rather quickly find out—and it seems likely that, if present, the ore deposits will be of good size. So we ask if the detailed, painstaking general geologic work of the Survey may not help to start another revival of this old bonanza camp.

And if true at Creede, may we also ask if there are not certainly other camps where recognition of alteration, cap rocks, and the time sequence in faulting so vital to the emplacement of fissure vein deposits, may "find ore" that no pick and pan prospector could ever hope to locate.

END

# NEWSMAKERS in world mining



P. V. BETHURUM



E. C. BITZER



J. BLEY



V. MATTSON



DR. E. THIEL



L. K. WILSON

**P. V. Bethurum** has been appointed mill superintendent of the 200 ton-a-day Falls City, Texas uranium mill of Susquehanna-Western, Inc. He brings to his new position a background as production foreman of the company's Riverton, Wyoming mill and as a petroleum engineer.

**Edmund C. Bitzer** has returned to private business as a Golden, Colorado consulting engineer after a 14-month assignment in Yugoslavia for the U.S. International Cooperation Administration. Mr. Bitzer, who has spent many years as a metallurgical engineer overseas, was assigned to make mechanical improvements at a lead-zinc mine 150 miles southwest of Belgrade.

**Robert O. Jones**, manager of the western division of The Standard Slag Company of Gabbs, Nevada, has been elected president of the board of directors of the Nevada Mining Association, Inc.

**C. Smith**, former group manager of underground mines for the United Steel Companies Ltd., Sheffield, England, has been appointed assistant general manager of the firm's ore mining branch.

**Jean-Pierre Altorffer**, former superintendent at the Mines De Zellidja, Zellidja Boukker, Morocco, has been named assistant manager at the Isoire plant of the Compagnie Generale de Duralumin et du Cuivre, Paris, France.

**Al Davidson**, former project manager for the Cerro de Pasco Corporation in Santiago, Chile, has accepted a position as general manager for the Compania Minera Castano Viejo in the Province of San Juan, Argentina. **Peter Parker** has recently accepted the position as mine superintendent. Castano Viejo is controlled by National Lead Company S. A. of Buenos Aires.

**A. E. McHugh**, associate professor of metallurgical engineering at the South Dakota School of Mines and Technology, Rapid City, South Dakota, has returned to the campus after a six-month tour of South America where he was a Fulbright lecturer in process metallurgy at the National University of Engineering in Lima, Peru.

**Albert B. Williams**, former superintendent of American Smelting & Refining Company's Santa Barbara unit in Chihuahua, Mexico, has been appointed vice president and general manager of the Northern Peru Mining Corporation, a subsidiary of ASARCO, with administrative offices in Lima, Peru.

**John Bley**, general manager and vice president of the American Chrome Company of Nye, Montana, has succeeded **Fred Burnett** as president of the Mining Association of Montana. Mr. Burnett has been elected chairman of the association's executive committee.

**Vernon L. Mattson**, former general manager of minerals for Kerr-McGee Oil Industries, Inc., has been named manager of research and development in recent personnel changes within the company. He will continue to be in charge of the company's metallurgical research laboratory at Golden, Colorado.

**E. C. Speers**, project manager at the Hayden, Arizona Ray Mines division of Kennecott Copper Corporation since 1959, has returned to the company's western mining division's engineering department in Salt Lake City, Utah.

**H. B. James** has been appointed secretary-treasurer and director of American Exploration & Mining Company of San Francisco, California, a subsidiary of Placer Development, Limited. Replacing **D. de S. Duke**, who retired after 27 years of service to the company, Mr. James has wide experience in production and management in the United States and foreign mining field.

**James P. Norrie**, consulting mining engineer of the Mufulira, Roan Antelope, Chibuluma Mines of the Rhodesian Selection Trust Group, has recently retired. He has been succeeded by assistant consulting mining engineer **Richard N. Harle**.

**Sidney C. Howell**, former manager of the North Mines district of Republic Steel Corporation, Silver Bay, Minnesota, has been appointed staff assistant to the manager of the Babbitt division. Other promotions made within the company are **Matthew R. Banovetz**, new assistant superintendent of the pelletizing department of the Silver Bay division; **Raymond J. Bertie**, assistant superintendent of the mining department at Babbitt; and **Joseph Pastika, Jr.**, acting staff engineer of the Babbitt engineering department.

**Dr. Clyde Williams**, organizer of the laboratories of Battelle Institute in continental Europe 10 years ago, has formed his own corporation, Clyde Williams Corporation, in Columbus, Ohio. The corporation, with headquarters on 50 West Gay St. in Columbus and branches in London, England, and Paris, France, will provide research, technical information, investment advisory, and management services in the United States and Europe.

**Dr. Edward Thiel** has been appointed assistant professor of geophysics at the School of Mines and Metallurgy at the University of Minnesota. He had been an investigator and project leader for the University of Wyoming's Antarctic research program, and Dr. Thiel will continue his Antarctic studies as chief scientist of the 1961-1962 airborne geophysical program.

**Kenneth Wilson**, exploration geologist for American Smelting and Refining Company for the past 17 years, has resigned to open consulting offices in San Francisco, California, at 400 Montgomery Street and in Menlo Park, California. He was in charge of ASARCO's west coast exploration office in San Francisco. He spent the past year in the eastern and southern states on various land problems. Mr. Wilson was ASARCO's specialist in problems of ownership and acquisition of property for exploration.

**Enrique Chico Villasenor**, mine foreman at Cia. Minera ASARCO S. A., Santa Barbara unit, Chihuahua, Mexico has been named mine superintendent at Minera San Martin S. A., Sombrerete, Zacatecas, Mexico.

**Robert W. Heinz**, former senior chemical engineer, has been named assistant triple superphosphate manager for American Cyanamid Company at Brewster, Florida.

**Sherman A. White**, former minerals consulting engineer, has been appointed production manager of International Minerals & Chemicals Corp.'s phosphate minerals and chemicals operations at Bartow, Florida, and **Deall Daymon**, formerly with the company's central staff, has been appointed staff manager of industrial engineering.

**William W. Watson** has succeeded **William A. Robins** as manager of mines and chief engineer of the Great Northern Iron Ore Properties at St. Paul, Minnesota.

**Kenneth J. Kutz** has been appointed mine superintendent at the Sunshine Mine, Shoshone County, Idaho, largest silver producer in the United States. He was formerly with Calera Mining Company in Idaho and the Lakeview Mining Company of Oregon.

**Emmett A. Torney**, former general sales manager for Bunker Hill Company at San Francisco, California, has been named sales manager for National Lead Company's metal division. His new office is in New York, New York.

# Metal & Mineral Prices

## U. S. A.

February 20, 1961

### METALS

<b>COPPER:</b> Electrolytic, Delivered F.o.b. cars, Valley basis (pound) ..	29.00c
Lake, Delivered, destinations, USA ..	29.00c
Foreign, Delivered, destinations, USA ..	29.00c
<b>LEAD:</b> Common Grade, New York (Per pound) ..	11.00c
Tri-State Concentrate, 80% lead, per ton ..	\$125.16
<b>ZINC:</b> Prime Western: F.o.b. E. St. Louis (Per pound) ..	11.50c
Prime Western: Delivered New York ..	12.00c
Tri-State Concentrate, 60% zinc per ton ..	\$68.00
<b>ALUMINUM:</b> Primary 50 Pound Ingots (99.5% plus) (Per pound) ..	26.00c
<b>ANTIMONY:</b> Lone Star Brand, F.o.b. Laredo, in bulk (Per pound) ..	29.00c
<b>BISMUTH:</b> (in ton lots) price per pound ..	\$2.25
<b>CADMIUM:</b> Sticks and bars, 1 to 5 ton lots Price per pound ..	\$1.60
<b>COBALT:</b> 97-99%, keg of 500 pounds (Price per pound) ..	\$1.50
<b>COLUMBIUM:</b> Ingot ..	Nominal, per pound \$36.00-\$55.00
<b>GERMANIUM:</b> dioxide, high purity, gram ..	16.75-21.75¢
<b>LITHIUM:</b> 98% (per pound) ..	\$9.00-\$12.00
<b>MAGNESIUM:</b> Ingots (99.8%) F.o.b. Velasco, Texas per pound ..	36.00c
<b>MERCURY:</b> Flasks, Small lots, New York ..	\$208.00-\$210.00
<b>NICKEL:</b> "F" Ingots (5 pounds) F.o.b. Port Colbourne, Ontario ..	75.50c
<b>PLUTONIUM:</b> To July 1, 1962 AEC will pay \$30.00 to \$40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram ..	\$30.00
<b>SELENIUM:</b> 99.5% per pound ..	\$6.50-\$7.00
<b>TELLURIUM:</b> Common grade, Per pound ..	\$4.00
<b>THORIUM:</b> per kilogram ..	\$43.00
<b>TIN:</b> Grade A Brands, New York (Per pound) Prompt delivery ..	101.25c
<b>TITANIUM:</b> 99.3% + Grade A-1 Sponge (Per pound) ..	\$1.50-\$1.60
<b>URANIUM:</b> Rod (0.790 U-235) \$16.00 Per Pound; Foil ..	\$16.75
U-235: Nominal (Per pound) ..	\$7.725
<b>VANADIUM:</b> 90% Grade ..	\$3.45
<b>GOLD:</b> United States Treasury Price ..	\$35.00 per ounce
London ..	\$33.16 per ounce
<b>SILVER:</b> Newly mined domestic, U.S. Treasury price per ounce ..	90.5¢
Foreign Handy Harmon ..	91.9¢
<b>PLATINUM:</b> Per ounce ..	\$82.00-\$85.00
<b>ZIRCONIUM:</b> Sponge, Per pound, Reactor Grade ..	\$5.00

### ORES AND CONCENTRATES

<b>BERYLLIUM ORE:</b> 10 to 12% BeO, F.o.b. mine, Colorado \$46.00 per unit Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at \$400.00 per short ton or by assaying at 8.0 to 8.9% BeO, \$40 per unit; 9.0 to 9.9%, \$45; over 10.0%, \$48.00.
<b>CHROME ORE:</b> F.o.b. railroad cars eastern seaports. Dry long tons. African (Rhodesian), 48% Cr <sub>2</sub> O <sub>3</sub> , 3 to 1 ratio .. \$35.00-\$36.00 African (Transvaal), 48% Cr <sub>2</sub> O <sub>3</sub> , No ratio .. \$26.00-\$28.00 Turkish, 48% Cr <sub>2</sub> O <sub>3</sub> , 3 to 1 chrome-iron ratio Nominal \$36.00-\$37.00 U.S. Government ore-purchase depot Grants Pass Oregon. Buying suspended, quota filled.
<b>COLUMBIUM-TANTALUM ORE:</b> Per Pound Pentoxide, Nominal .. \$1.10
<b>IRON ORE:</b> Lake Superior, Per gross ton Lower Lake Ports Mesabi, Non Bessemer, 51.5% Fe .. \$11.45 Mesabi, Bessemer, 51.5% Fe .. \$11.60 Old Range Non Bessemer .. \$11.70 Old Range Bessemer .. \$11.85 Lump: Plus 1/2-inch .. \$12.85 Fines: Minus 1/2-inch .. \$10.72 Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit .. \$24.00-\$25.00 Brazilian, Atlantic Port, 68 to 90%, Long ton unit .. \$22.00-\$25.00 Venezuelan, Orinoco No. 1, 58% Fe, f.o.b. Porto Ordaz .. \$8.95
<b>MANGANESE ORE:</b> Metallurgical grade, 48 to 50% Mn Long ton unit .. \$0.95-\$1.00 Metallurgical grade, 46 to 48% Mn, Long ton unit .. \$0.90-\$0.95 Metallurgical grade, 44 to 45% Mn, Long ton unit .. \$0.85-\$0.90 Domestic U.S. Government, GSA Basis \$2.30 per unit for 48% Mn.
<b>MOLYBDENITE CONCENTRATE:</b> 90% MoS <sub>2</sub> , F.o.b. Climax, Colorado, Per pound Mo, plus container cost .. \$1.25
<b>TUNGSTEN CONCENTRATE:</b> Domestic, 60% WO <sub>3</sub> Per short ton unit .. Nominal \$24.00 Foreign: 65% WO <sub>3</sub> Per short ton unit (Scheelite) .. Nominal \$23.50 Foreign: South American, Spanish, Portuguese .. Nominal \$23.00
<b>URANIUM ORE:</b> F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is \$1.50 per pound of U <sub>3</sub> O <sub>8</sub> in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.

### NON-METALLIC MINERALS

<b>BARITE:</b> Oil well drilling, Minimum 4.25 specific gravity, per short ton .. \$16.00
<b>BENTONITE:</b> Minus-200mesh, F.o.b. Wyoming, Per ton, carload lots .. \$12.50 Oil Well grade, Packed in 100 pound paper bags .. \$14.00
<b>BORON:</b> technical grade .. F.o.b. Baron California, Per ton .. \$47.50
<b>FLUORSPAR:</b> Metallurgical grade, 72.5% effective CaF <sub>2</sub> content per short ton F.o.b. Illinois-Kentucky mines .. \$37.00-\$41.00 Mexican, 70% F.o.b. border, Duty paid .. \$26.00-\$27.00 Acid Grade, 97% CaF <sub>2</sub> Bulk, F.o.b. mine .. \$45.00-\$49.00
<b>PERLITE:</b> Crude: F.o.b. mine per short ton .. \$3.00 to \$5.00 Plaster grades, Crushed and sized, F.o.b. plants .. \$7.00 to \$9.00
<b>SULPHUR:</b> Long ton, F.o.b. Hoskins Mound, Texas .. \$22.50-\$23.50

## London

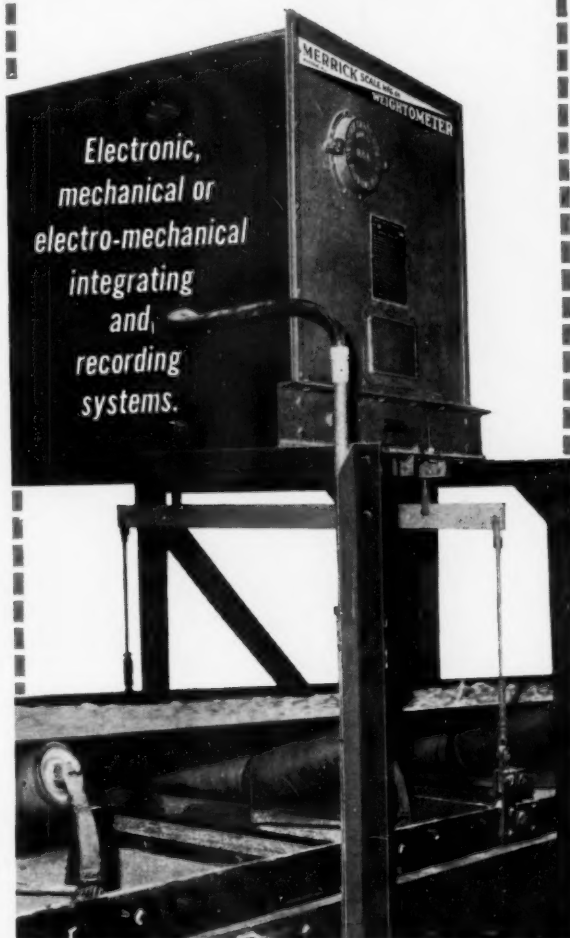
February 20, 1961

	Per Long Ton	USA Equivalent	cents per pound
<b>COPPER:</b> Electrolytic, spot ..	£224	15c 0d	28.09c
<b>LEAD:</b> Refined 99% ..	£ 66	12c 6d	8.33c
<b>ZINC:</b> Virgin, 98% ..	£ 84	5c 0d	10.53c
<b>ALUMINUM:</b> Ingot, 99.5% ..	£186	0c 0d	23.25c
<b>ANTIMONY:</b> Regulus, 99.6% ..	£210	0c 0d	26.25c
<b>TIN:</b> Standard, 99.75% ..	£793	0c 0d	99.13c
<b>TUNGSTEN:</b> Long ton unit ..	£ 0	132c 0d	\$18.48c

\*With Sterling Pound at \$ 2.80

Quotations on metals and certain ores through the courtesy of American Metal Market, New York, N. Y.

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## The Merrick® WEIGHTOMETER

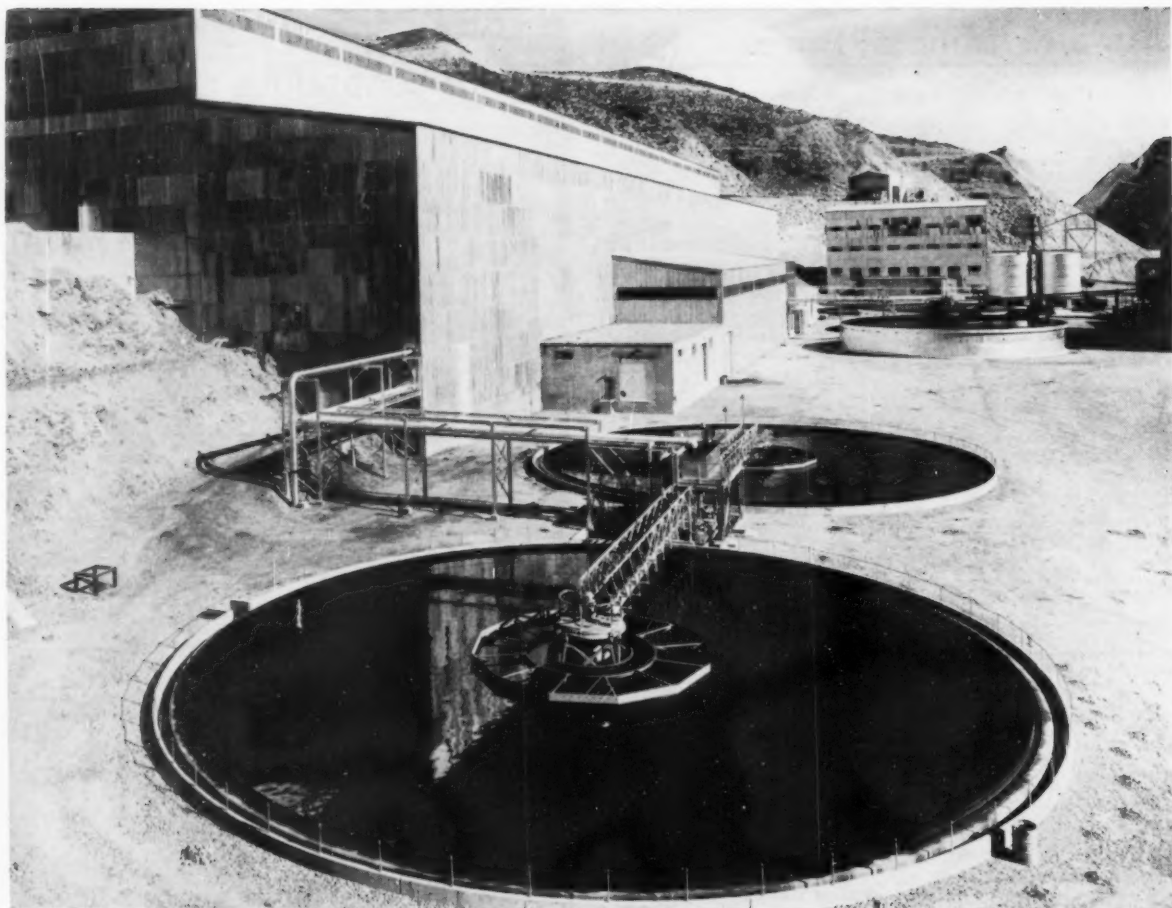
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# PROJECT — COPPER

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This smoothly operating project including copper mill, smelter and power plant was designed to process 30,000 tons per day. The engineering performed by Stearns-Roger included designs for concentrator, smelter, heavy density plant, power plant, crushing plant, and specifications for thousands of items of mill and smelter equipment. Engineering of supporting facilities also furnished includes two complete townsites, public buildings, machine and maintenance shops at mine, mill and smelter, transmission lines and lime plant.

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# PRODUCTION EQUIPMENT preview

FOR DATA ON ANY ITEM IN THIS SECTION PLEASE USE INQUIRY CARD

## Self-Propelled Rotary Rig Drills Three-Inch Hole to 250 Feet

A one-man, self-propelled, self-contained, hydraulically operated, highly versatile Model H.D. 250-S Hi-Vacuum rotary drilling rig has been built by the Houston Tool Company of California.

This new unit is completely self-sustaining, carrying all its own equipment and tools—plus 250 feet of drill pipe. It operates on a 30 horsepower, four cylinder, air-cooled engine with four speeds forward and one reverse. Hydraulically steered, it is very maneuverable, and driving controls are immediately adjacent to drilling controls. The rig is also equipped with a tongue and hitch for easy highway towing.

In addition to vacuum drilling (which requires no water in dry formations, takes 100 percent continuous sample, and cannot lose circulation even in broken and fissured formations) the Model H.D. 250-S drills with forced air; with forced water; with reverse water; vacuum with water; drive core sampling; augering; diamond core drilling with vacuum, with forced water; bucket drilling; and can also drive casing while drilling.

According to the manufacturer, this versatile drill is rated  $2\frac{3}{4}$  inch to 3 inch diameter hole to 250 feet. It drills at any angle and in all formations. Twin, clear plastic tubes provide a continuous examination of the stratum being drilled and make grab samples easy without interrupting drilling. By use of a plastic bag interliner, inch-by-inch samples may be taken and retained for analysis, shipment and storage. Circle No. 1.



## New Design Concept in Dump Trailers

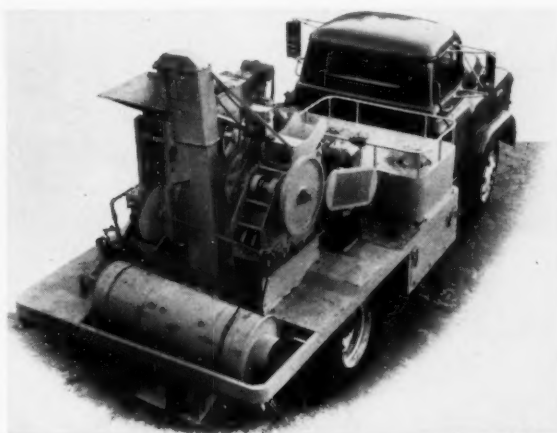
A daring new design concept in dump trailers now enables trailer owners to gain maximum axle-load allowances in all 50 states by hydraulically positioning the payload on an extra length trailer chassis.

The Hydra-Shift PAY-PAC is jointly manufactured by Spencer-Safford Loadcraft, Inc. and Daybrook Hydraulic Division of Young Spring and Wire Corporation. The new unit uses a 4-section, telescopic double-acting hydraulic hoist to both position the 24-foot body on the extra-length chassis, and to dump the payload. From its predetermined transport position, governed by local gross weight restrictions and number of axles carrying the payload, the body is hydraulically moved to the rear where it automatically locks for dumping. Circle No. 24.

## Compact Concentrator Is Truck-Mounted

A revolutionary new gravity-flotation mill that weighs 3,000 pounds and is truck-mounted is being manufactured by the Shelton-Cheney Mining Company. The Ore-Bee mill is complete, combining for multiple or separate operation a crusher, pulverizer, concentrator and elevator. It can be operated by one man and is suitable for a wide range of mining applications.

The mill is said to have a capacity of from 10 to 15 tons per day, with 98 percent recovery, of any ore that can be concentrated by gravity flotation. The mesh can be adjusted for all ores, from the coarse 10-mesh screen up to the finest stages. The concentrator riffles are interchangeable, and the drum is self-cleaning. Though able to handle many types of ore, the Ore Bee mill is especially adaptable to gold milling. Circle No. 23.



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## ROPE MASTER SLUSHER BLOCKS

Appearance alone stamps ROPE MASTER as a block that is different, and its many plus features have made it the block most in demand. Our continued program of product improvement guarantees the best by comparison.

The streamlined sides and ideal balance gives faster positive pick-up under the slightest load — eliminate fouling and hang-ups — give longer life to wire rope and blocks — make the use of larger blocks practical.

ROPE MASTER MINING BLOCKS  
ARE AVAILABLE WITH THESE FITTINGS

SWIVEL HOOK  
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SWIVEL SHACKLE  
FLAT TYPE SHACKLE  
SAFETY SWIVEL HOOK  
SNATCH LOCK

INCREASE WIRE ROPE LIFE —  
REDUCE WIRE ROPE COST

**PAUL E. KEENEY CO.**

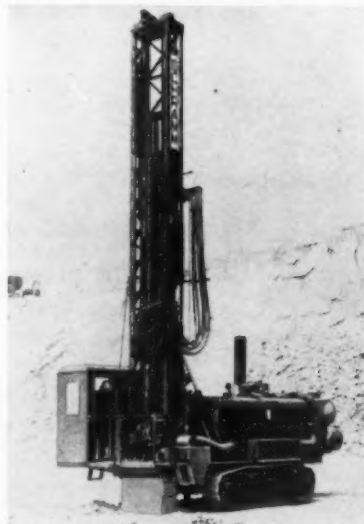
1125 S. E. Grand Avenue  
Portland 14, Oregon

## Completely Self-Contained Blast Hole Drilling Rig

A completely new self-contained blast hole drilling rig has been introduced by Schramm, Inc. of West Chester, Pa. The model C66 crawler Rotadrill is designed for one man operation with all controls for drilling and maneuvering conveniently located in the operator's cab on the work platform. A separate air compressor is not required since a 600 cfm unit is built into the rig. The "Lazy Susan" rack mounted in the mast holds extra drill pipe ready to be swung under the drive sub and threaded as needed. Hydraulic rams in the mast can exert variable down pressures to 28,000 pounds.

The model C66 is completely powered by hydraulics. Optional equipment includes a set of lights which mount on the mast for night operation.

The model C66 offers a choice of two masts, one with 25 foot travel and the other with 35 foot travel. The wide track spread affords excellent stability in rough terrain. Circle No. 79.



## New Epoxy Bonding Kit

Epoxy adhesives contained in Adhesive Engineering's new "All Purpose Bonding Kit" now enables maintenance men to quickly and permanently bond or repair almost any building material.

The easy-to-carry kit is filled with three kinds of epoxys—Concresive No. 1, Concresive No. 2, and Methhesive. With them maintenance men can quickly make on-the-spot repairs to concrete, brick, masonry, stone, steel, cast iron, copper, and scores of other building materials. Circle No. 84.



## Effective Mercury Detector

Developed mainly for geochemical surveying and prospecting for mercury, this lightweight instrument is offered by Lemaire Instruments, Tuba City, Arizona. The range of the Type S is .005 to 50 parts per million of mercury, and takes less than one minute to make a determination. Completely transistorized, the instrument is easy to operate and uses standard, readily available batteries which have a long operating life. Circle No. 90.

## Hydraulic Press for Cable

Mighty Mark, a portable, self-contained hydraulic press designed for processing cable on the job site is being manufactured by Mark Naught, Inc. of Portland, Oregon. The Mighty Mark develops up to 15 tons pressure and is used for cutting cable, making slings, etc. on the job. Circle No. 19.

## Utility Diesel Introduced

A new, lightweight Diesel engine, featuring high quality British craftsmanship, has been introduced to the mining industry by Trans-World Trade of Beverly Hills, California.

The Norman Diesel is a single cylinder, cold starting, four-cycle engine with indirect injection (with vertical air cooling) and featuring the Sanders patented high efficiency combustion chamber. A simplified engine fan performs the cooling function. The crankcase, a one piece high grade iron casting, totally encloses all working parts. A counter clock-wise rotating crankshaft is fabricated from an unusually high quality casting and is supported on lead-bronze bearings. Circle No. 86.

## Reversible Belt Splice

Conveyor installations using belts manufactured entirely of an interwoven carcass may now be spliced with a new modern reversible belt splice that is designed for quick, simple installation. The heavy duty, hinge-type "Minet" splice eliminates the need for templates, drilling or hole punching according to the General Splice Corporation. A unique design permits installation of the splice in one piece. As the conveyor operates, the hinge plate separates into sections at pre-scored notches to conform with conveyor trough curvature. The one piece design assures closest possible fit resulting in a tight, leakproof yet flexible joint. Circle No. 77.

# MORE NEW EQUIPMENT . . . AND NEW LITERATURE

**GROUSER SHOE/SPROCKET** reconditioning is now possible with a new machine being marketed by Victor Equipment Company which rebuilds tractor grouser shoes and drive sprockets to factory specifications. Circle No. 28.

**MINING EQUIPMENT** including automatic mine doors, dusting machines, ore car transfers, track cleaners, switch machines, and re-railers are described in a new 16-page catalog just published by the American Mine Door Company. Circle No. 32.

**METAL PRIMER** that provides good bonding qualities and overall high chemical resistance is described in a new technical bulletin issued by Wisconsin Protective Coating Corp. The new heavy duty epoxy type primer contains lead silico chromate, iron oxide and leafing type pigments. Circle No. 33.

**APPLICATION DATA SHEET** aimed at clearing up some of the ambiguity surrounding the term "density" has been published by the Scientific and Process Instruments Division of Beckman Instruments, Inc. Circle No. 35.

**PHOTO MOSAIC MAP** that shows coverage available in Alaska has been prepared and is now ready for distribution by Fairchild Aerial Surveys. For a copy of this coverage map circle No. 63.

**DRILL STEEL** treated with the exclusive Sandvik process is protected against corrosion, and provides from 30 to 50 percent longer life than untreated steel according to Atlas Copco. Circle No. 38.

**SPIRALWELD PIPE** and Wedgelock couplings made by the Naylor Pipe Company save time, work and money when used for pipelines in mining service. Details about this lightweight, efficient pipe are given in Bulletin 59. Circle No. 39.

**WIRE SCREEN HANDBOOK**, issued by Hoyt Wire Cloth Company, is loaded with useful information and money-saving suggestions for all users of wire screens. For a free copy circle No. 46.

**WIRE SCREENS** with the exclusive raffle markings on the upper surface keep openings free and clear, provide top efficiency, and long service life according to Hendrick Manufacturing Company. For details on Wedge Wire and Raffle Top screens circle No. 41.

**BELT CONVEYOR** plants and materials handling equipment made by A. Muller & Sohn are described in an illustrated six-page brochure that shows the scope of operations of this large West German manufacturer. Circle No. 70.

**MAGNETOMETER** that weighs only three pounds, has a range of from 10 to 250,000 gammas, and has proven highly effective in the Michigan iron ranges is the Finnish Jalander instrument marketed by Jordan International. For further information circle No. 48.

**FLEXIBLE MASK GOGGLES** manufactured by the American Optical Company have been improved to make them more comfortable and safer to use. For details and information on these lightweight, well-ventilated goggles circle No. 43.

**SPACEMAKER CONTROLLER** is a new concept in high voltage control. A new bulletin released by Allis-Chalmers details the design and operating features of this new motor control center. Circle No. 49.

**ENGINEER'S LEVEL** that is accurate, lightweight, and rugged is the Wild N-2 manufactured by Wild Heerbrugg Instruments, Inc. Features include 24 or 28 power telescope, internal focusing, and coincidence-reading tubular level. Details on this precision instrument are given in Booklet N-2. Circle No. 40.

MARCH 1961

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91	92	93	94	95	96	97	98	99	100

[2]

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IMPORTANT: Following information must be given to insure prompt reply:

Nature of your firm's business \_\_\_\_\_  
(Such as: mining, consulting engineers, government, etc.)

Your exact title, job or position \_\_\_\_\_  
(Such as: mine supt., mill foreman, mining engineer, managing director, etc.)

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[1]

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Company or Firm \_\_\_\_\_  
(Print Clearly)

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**WELDING ELECTRODES** that have been successfully used in three varied industries are described in a new eight-page folder that contains case history reports. The McKay Company offers this bulletin free. Circle No. 50.

**TRUCK CRANE:** A comprehensive, 16-page technical portfolio showing features and capabilities of the P&H Model 255B-TC truck crane is now available from Harnischfeger Corporation. Circle No. 51.

**THE ENGINEERING INDEX** continually reviews 1,800 engineering and technical publications printed in 44 countries, and annotates pertinent information on a small resume card. These short resumes are available to interested engineers who can then obtain a copy of the original article. For a copy of the current catalog circle No. 45.

**OUTDOOR FLOODLIGHTS** and other industrial lighting fixtures are the subject of a new eight-page catalog S-61 just issued by Stonco Electric Products Company. Circle No. 72.

**LAPIDARY** is the subject of a new two-color brochure titled "An Introduction to the Art of Lapidary" issued by the Carborundum Company. This free, 12-page bulletin discusses grinding, sanding, polishing, lapping, and tumbling of semi-precious gems in addition to other useful information. Circle No. 52.

**REVERSING MOTORS** by Louis Allis Company are available in a complete line of integral HP, polyphase ratings offered in Open Drip-Proof, Totally Enclosed Fan-Cooled and Non-Ventilated enclosures. Bulletin 1800 gives complete information. Circle No. 53.

**CABLE SUSPENSION SYSTEM:** An illustrated four-page catalog describing in detail the newly introduced Line-Flex Cable Suspension System for mines is now available from Perfect-Line Mfg. Corporation. Circle No. 54.

**EARTHMOVING EQUIPMENT** manufactured by Harnischfeger is the subject of a new eight-page bulletin just released. Described are the 40 basic

models of P&H power cranes and shovels that will be offered to the mining industry in 1961. Circle No. 55.

**CLUTCHES** specially designed to prevent runback or reverse travel of inclined conveyors, bucket elevators, and related materials handling or operating equipment is the subject of a new 12-page catalog just released by Formaprag Company. Circle No. 56.

**PUMPS:** Complete specifications and details of the Model 3405 line of single stage, double suction centrifugal pumps manufactured by Gould Pumps, Inc. are given in the new Bulletin No. 721.6. Circle No. 57.

**COUPLINGS** of any size for any application are Steelflex couplings made by The Falk Corporation. The 23-page Bulletin 4100, complete with charts, tables, and up-to-date engineering data, presents Falk's complete line. Circle No. 58.

**ASBESTOS AND ASPHALT** products for mining and industry are detailed in a special 18-page reference catalog released by The Philip Carey Manufacturing Company. Circle No. 59.

**DUST COLLECTING,** recovery, and classifying equipment is the subject of a recently issued four-page bulletin published by Buell Engineering Company. Buell-Norblo equipment has a wide application in the air pollution, material handling and classification fields. Circle No. 60.

**MILL LINERS:** "Engineering Properties and Applications of Ni-Hard" is the title of a detailed 58-page booklet which suggests many ways to put versatile nickel-chromium-iron alloy shell liners to work profitably for you. For a copy of this booklet from International Nickel Company circle No. 61.

**DUST AND FUME CONTROL:** "Wheelabrator Worldwide" is the title of a new 16-page brochure that pictorially describes the export facilities and worldwide operations Wheelabrator Corporation has developed to meet the growing needs of industry for metal cleaning and finishing equipment, and dust and fume control equipment. Circle No. 44.

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# WHAT'S GOING ON in mining

## American Exploration & Mining Joins in Utah Silver Venture

New partner in a venture to develop the old Holt silver mine six miles north of Enterprise Utah is American Exploration and Mining Company of San Francisco. A subsidiary of Placer Development Company of Vancouver, British Columbia, American Exploration is one of the two firms that recently sold their Nevada iron ore property to United States Steel Corporation for over \$4,000,000.

The San Francisco firm has joined Armet Company and Chief Consolidated Mining Company for development of the property in Iron County where an extensive diamond drilling program has been carried out for the last three years. Earlier, these two firms joined Cerro de Pasco Corporation in investigating the deposit. Samuel A. Arentz, Armet president, is operator on the present project.

A 24-inch hole is now being drilled at the mine for the purpose of shaft location and unwatering of the property. In order to mine the ore, which is practically at the surface in one area, a 600-foot shaft will probably be required.

Development work so far, mainly by drilling, has blocked out several hundred thousand tons of ore that assays about 30 ounces of silver per ton, and contains small amounts of lead.

The mine reportedly dates back to 1896 when the deposit was discovered by a prospector named Holt. The only mining seems to have been done in the 1930's by a Cincinnati group.

## Kennecott Cuts Eureka Fissure, Begins Smelter Modernization

Kennecott Copper Corporation's Tintic district, Utah, exploration program has located what is believed to be an extension of the famed Eureka Standard fissure system, object of the program begun over five years ago. The ore zone is about 1,500 feet west of the Burgin shaft where Kennecott is sinking an incline winze.

Kennecott picked up the probable extension when lead ore was encountered while the No. 311 drift was being driven in quartzite. The hanging wall is brecciated shale while the foot wall is of the quartzite. A major segment of the ore body was 40 feet wide and ore has been developed across 70 feet. Assays of the 40-foot segment average about 15 ounces of silver per ton, with 25 percent lead, and small amounts of copper and zinc.

Assays of a six-foot section of the shale proved to be ore-bearing also, showing 50 ounces of silver and 4 percent lead

per ton. How far the silver values penetrate the shale is yet to be determined.

A seven-foot section of the zone assayed 20 ounces of silver, 37.8 percent lead, 0.2 percent copper and 0.2 percent zinc, while a five-and-a-half-foot sample ran 48.5 ounces of silver, 41.1 percent lead, 0.25 percent copper and 0.2 percent zinc per ton.

Another ore zone being developed in the northwest sector of the winze area, about 1,000 feet west of the Burgin shaft may also prove to be an extension of the Eureka Standard. This could mean that another 500-foot area between the winze and the 311 drift might contain high grade silver-lead ore.

Sinking of the winze to investigate water and rock conditions, and determine best location for a production shaft, is continuing. Heavy ground has been encountered and there is a heavy water flow in the winze area. Water temperature is about 130° F.

In another phase of its Utah operations, Kennecott has begun a \$5,000,000 program that is the first step in a long-term rehabilitation of its Garfield smelter. Principal change in the current modernization will be installation of a new material handling system by Rust Engineering Company of Baltimore, Maryland and Birmingham, Alabama.

The new system will include the first

## Climax Protects Tailing Pond Pipeline By Grouting Abandoned Stope

Climax Molybdenum Company's fast growing tailing pond, 33,000 tons per day, has engulfed the old lead-silver-zinc mining camp of Robinson, Colorado and is now covering some of the famous mines.

This time it's the Lucky Strike where American Smelting and Refining Company made such important lead-zinc production during World War II.

The abandoned workings of the Lucky Strike have begun to cave in and collapse, placing in jeopardy a 36-inch pipeline located above them. The pipeline is the major conduit for water re-claimed from Climax's new Tenmile Tailing Pond, located four miles north of the Climax mine.

At present there is no immediate danger to the pipeline. But Climax engineer Douglas May and his staff of tailing engineers agree that as tailing is deposited in the new area to a depth of 330 feet, the weight of the tailing will collapse the old workings completely. Should this occur, the decant pipeline would be destroyed, or at least deformed, in the collapsing movement.

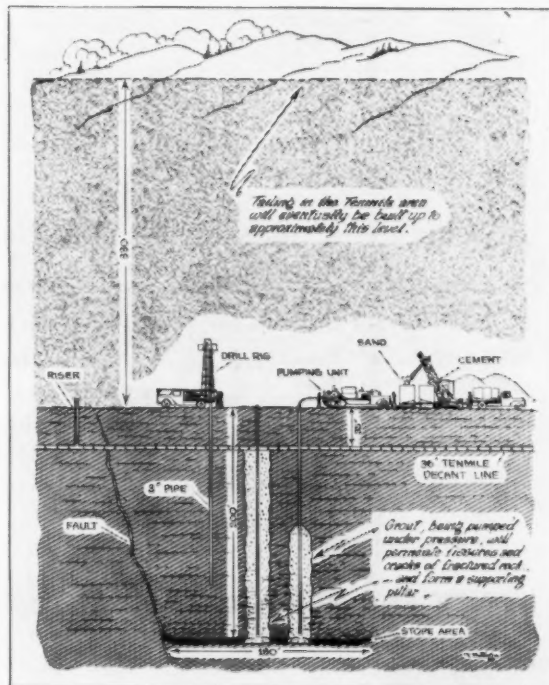
To stabilize the area under the pipeline, 28 holes are being drilled to a depth of 200 feet into the abandoned stopes. Located on both sides of the decant pipeline, 10-foot out from the centerline, the holes will be spaced at 20-foot intervals parallel to the pipeline.

After a hole has been drilled and cased with a 3-inch pipe, the Halliburton Oil Well Cementing Company of Duncan, Oklahoma, will pump grout down to fill the stope. After the stope has been filled under the hole, the grout will be forced under pressure into the cracks and fissures in the rock strata surrounding the hole. This will form a grout pillar to support the pipeline and tailing to be deposited over it.

The stope area which is creating the problem is part of the Lucky Strike mine which was among the first to open in the Kokomo, Colorado mining district in the summer of 1887. Silver poured from its portals until the silver panic of 1893 which caused production in the district to decline.

In later years the mine was operated in relation to market demand and during the 1940's, the lower workings which are now collapsing, were developed and exploited by American Smelting and Refining. The mine was abandoned completely in May of 1950, after retreat mining and robbing the pillars in the stope area.

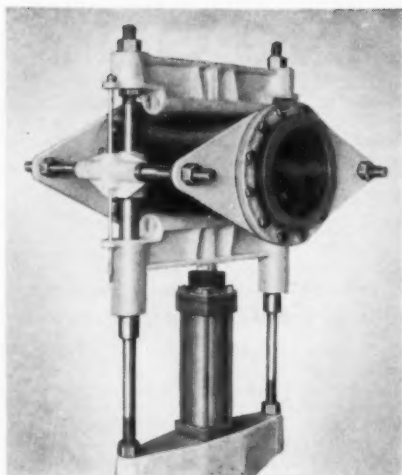
The original stope beneath the pipeline averaged 16 feet in height and was 180 feet wide. Gradually it filled with water and collapsed, leaving about a 4-foot opening. Climax believes that the collapsing movement has caused overlying rock strata



to become separated and absorb the collapsing movement. As a result no subsidence area is visible on the surface over the caved area.

Climax hopes to complete the grout pillars by the end of March and then drill holes at 10-foot intervals between the grout holes to determine if the stope has been filled and the underlying rock formations stabilized.

# AUTOMATED Hydral-60 PINCH VALVE SYSTEMS

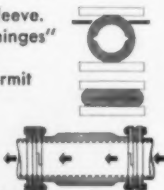


## Controlled circuitry for any operating requirements

- The Massco-Grigsby Hydral-60 System consists of one or more pinch valves with a single automatically operated hydraulic pump.
- Hydraulic pump may be operated by electric motor or by air from normal plant supply system.
- Valves may be the same or different size.
- Valves in the system may be operated simultaneously or independently.
- Control valve may be manual or solenoid.
- Valves are self-supporting and may be operated in any position from horizontal to vertical.
- Valves may be coordinated and interlocked with other plant equipment to automatically control tank levels, rate of flow, etc.
- Valves may be independently controlled for normal or rapid closure.
- Valves may be held fully open, fully closed, or at intermediate positions.
- Remote control to meet individual requirements.
- Controls may be included for automatic emergency operation.
- 3" to 14" I.D. sizes, with 50, 100, and 150 psi line pressure ratings.
- Temperatures to 200° F.

## Advantages of Massco-Grigsby Pinch Valves

- Rubber, neoprene and special compounded rubber sleeves for corrosive and abrasive pulps and liquids.
- Patented "hinged" sleeve. Recesses serve as "hinges" during compression; reduce strain and permit tight closing.
- Unobstructed flow eliminates high friction loss and prevents contamination.
- Split flanges and patented Flex Seal ends assure perfect seal.
- Rugged, heavy duty construction for most severe service and long life.
- Cannot leak or stick.
- No working parts in contact with pulp or liquid; no packing glands.



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## WHAT'S GOING ON . . .

### ROCKY MOUNTAIN

use of a 100-ton car dumper that dumps in two directions for segregation of materials. To be constructed by Heyl-Patterson Inc. of Pittsburgh, Pennsylvania, it will dump one direction for materials that require crushing, and the other for those that do not need it. It will also weigh the car electronically, providing gross, tare, and total dump weight for each car, and total net weight.

In the new system, concentrates will go by conveyor directly to reverberatory furnaces from the car dumper, with fluxes and recycled materials blended to make a reverberatory charge. An automatic, continuous, screw conveyor will collect flue dust and return it to the concentrate storage building. Push button control of all conveyors will shut down the entire system if one belt stops, to insure uniform movement of materials at all times.

The electrification project at the smelter, due for completion in May, involves supplying power to the smelter from Kennecott's 175,000-kilowatt central power station. The renovation will enable the smelter to draw or feed back power and make the Copper Division self-sustaining on its own power. This project includes addition to the switch gear at the refinery, a two-circuit, 2½-mile long transmission line and a new sub-station at the smelter.

## Colorado

Five crews of Climax Molybdenum Company operations at Climax, Colorado, completed nearly 150,000 man-hours during 1960 without a single minor accident. Leader of the five was John Ostrom's Phillipson Level supply and maintenance crew which completed its third consecutive year with no accidental injuries. In 1960 the crew worked 64,259 hours to achieve this record. Top record among surface crews was made by Myron Woods' mill operation crew, with a record 30,923 man-hours in 1960 without accident. In the crusher department three crews remained accident-free throughout the year. These were Milford Kennedy's with 28,783 hours; Don Moffett's—11,602 hours, and Frank Clark's—10,683 man-hours.

Bids from five firms were received by the Atomic Energy Commission, Grand Junction, Colorado, operations office for 17 lots totalling 1,581,000 pounds of fused vanadium oxide which it bought during the uranium boom as an incentive to mining of uranium-vanadium ores. Bidders were the Vanadium Corporation of America, Union Carbide Metals Corporation, Metallurg, Inc., Overseas Metal Corporation, and Derby & Company, Ltd. Union Carbide bid 98½ cents a pound on lots 1 to 9; Metallurg bid up to \$1.01 on one lot. Lowest bid on a single lot was 68 cents by Derby & Company, while Vanadium Corporation bid up to \$1.072 a pound on some lots. The 17 lots of varying grade average 95,000 pounds, ranging from 30,000 to 101,500 pounds. Final price expected by AEC is about \$1.00 a pound, which was the price paid by Vanadium Corporation last spring when it purchased an entire lot of 1,500,000 pounds. Yearly United States production of vanadium in ores and concentrate is about 14,000,000 pounds.

## Utah

Recently completed negotiations by **Beryllium Resources, Inc.**, gave a 29½ percent interest in the company to each of three firms, **Brush Beryllium Company** of Cleveland, Ohio, **Federal Resources Corporation** of Salt Lake City, Utah, and **Hidden Splendor Mining Company**, also of Salt Lake. The remaining interest is held by E. Van Dornick, vice president of **Dynamic Metals Corporation**, which was recently merged into Beryllium Resources. Brush Beryllium is the world's leading producer of beryllium metals, alloys and products, while Federal and Hidden Splendor are active in mining and milling, principally uranium. Van Dornick is the developer of a flotation process for the concentration of beryllium minerals which will be used by Beryllium Resources for a mill planned in connection with development of its Topaz Mountain beryllium deposit northwest of Delta, Utah. The Van Dornick process will probably be used to reduce the Topaz area ore to concentrate, then be converted by Brush Beryllium to beryllium metal or oxide powder. The method reportedly can work with ores as low as 0.07 percent oxide content. According to Bruce W. Odum, Beryllium Resources president, the company's aims are to engage in mining, milling and beneficiation in this country and to rent out its process on a fee basis to firms in other countries where the process may be applied to work deposits of hand-picked beryl.

**Texas Gulf Sulphur Company** has invited bids for sinking of a 2,300-foot, concrete lined 20-foot diameter shaft at its \$30,000,000 Cane Creek, Utah, potash project. The contract will probably be let in mid-March. **Stearns-Roger Manufacturing Company** of Denver, which will design and construct the surface plant, will also build the shaft headframe. Texas Gulf expects to have the mine in production and the 10,000-ton-per-day mill in operation sometime next year. The **Denver & Rio Grande Western Railroad** will invest \$5,000,000 in construction of a 40-mile track from its main line in Utah to the Texas Gulf plant. Rio Grande will operate and maintain the line and will own the spur. A tunnel one and a half miles long will have to be driven along the banks of the Colorado River. The new line will require some 7,885 tons of steel rail. **Colorado Fuel and Iron Corporation** mills at Pueblo, Colorado, reportedly will supply more than \$1,000,000 worth of rails, switches and related equipment for the spur line.

**United Park City Mines Company**, lead-silver-zinc producer in the Park City district of Utah, anticipates that an encouraging outlook for development of new ore in two of its projects, plus OME assistance, will improve the firm's financial outlook. For the first nine months of last year the company reported a net loss before depletion of \$111,381. United Park City is engaged in a joint venture with **Keystone Mining Company** for development of an ore body in the Park City district, and has other development programs in Salt Lake, Summit, and Wasatch Counties.

**Union Carbide Nuclear Company**, division of **Union Carbide Corporation**, closed its ore upgrader at Green River, Utah in February. The mill was built in 1958 and has been in operation continuously since that time for uranium ore

sampling, grinding, and upgrading. The mill's function will now be consolidated with the firm's other mills, according to J. L. Lake of Grand Junction Colorado, general manager for Union Carbide Nuclear's Colorado Plateau operations. Union Carbide representatives are contacting independent ore producers in the Green River region with respect to shipping ore to the company's mills at Rifle and Uravan, Colorado.

Operations at the **U. S. and Lark** mines, as well as at the Midvale, Utah, mill of **United States Smelting, Refining and Mining Company** have continued on a normal basis during the past year.

## Wyoming

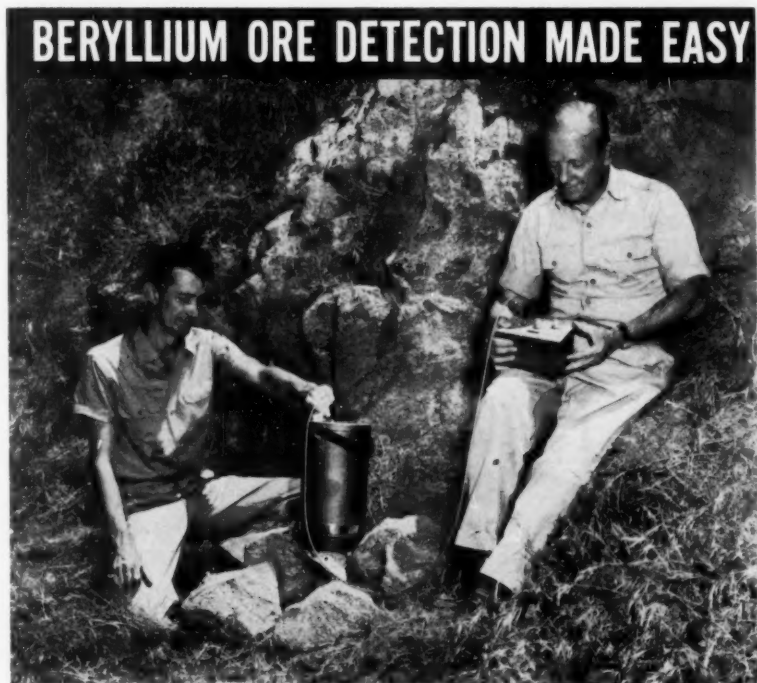
The development program to prepare the ore body for mining at the **Green Mountain Uranium Corporation's** uranium mine near Jeffrey City, Wyoming,

has been completed and mining is under way. About 50 men are currently employed at the mine, with Elton Clark as engineer in charge. Green Mountain is a subsidiary of **Phelps Dodge Corp.**

The sixth annual convention of the **Wyoming Mining Association** will be held April 21-22 in Rawlins, Wyoming. About 350 delegates and guests are expected to attend, according to Russ W. Beamer of Riverton, association secretary.

**Federal-Radorock-Gas Hills Partners**, operators of a uranium mine and mill in Wyoming's Gas Hills district, has recently developed a new ore body containing 100,000 tons of commercial grade uranium. A sixty percent interest in the venture is owned by **Federal Resources Corporation** of Salt Lake City, Utah.

Mineral production in Wyoming during 1960 showed a 10 percent advance over 1959 with significant increases in production value of uranium (65 percent) and in sodium carbonate.



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**A** new detection machine is now available to prospectors of Beryllium ore. The "Berylometer" can be used directly on outcroppings, boulders, and any other likely looking rock formations. Eliminates the old fashion time consuming method of chemical analysis.

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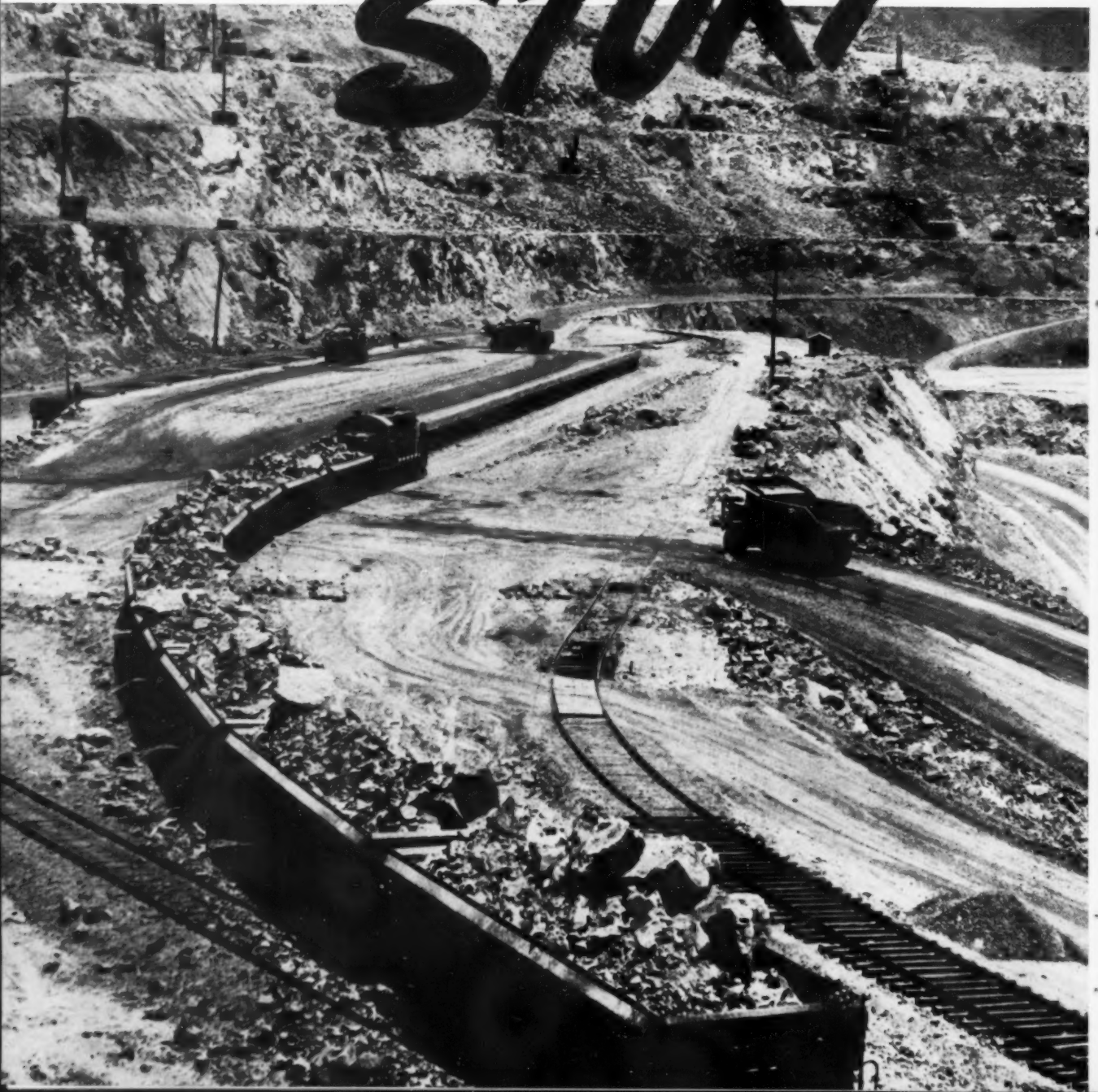


**NUCLEAR CORPORATION OF AMERICA**

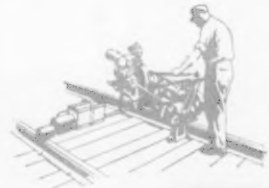
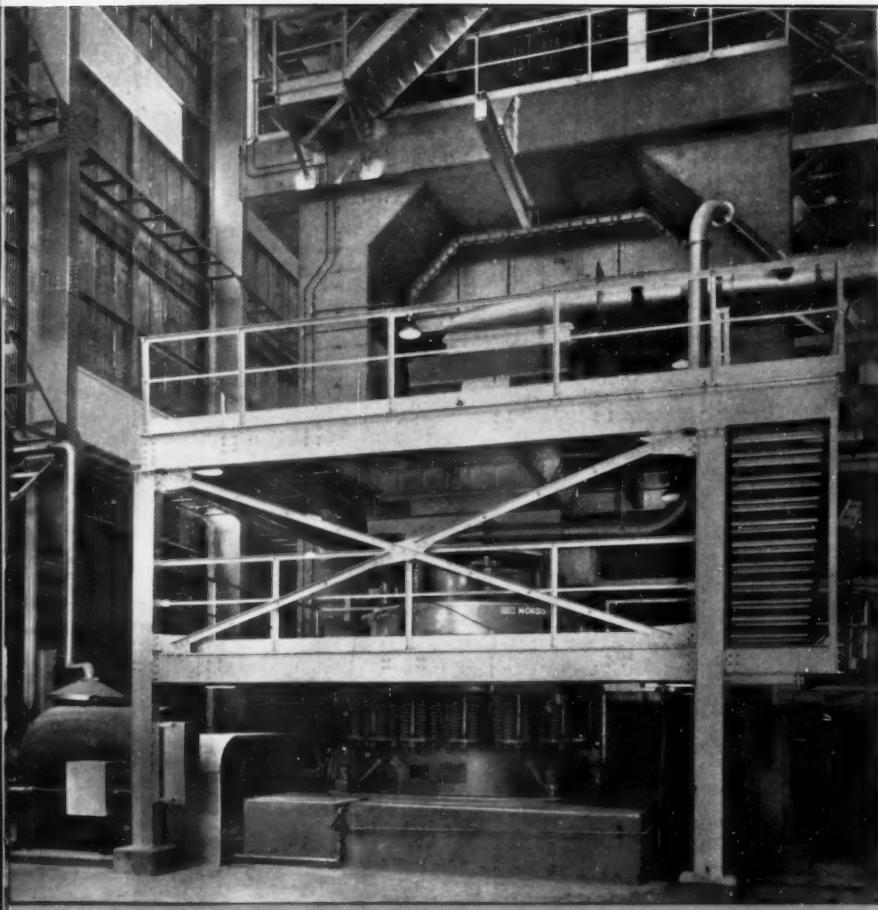
Box 431 — Burbank, California

Nordberg Machinery plays important part in the

# "TOQUEPALA" STORY

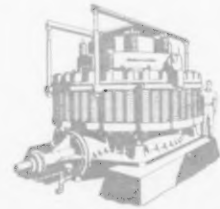






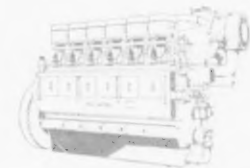
**NORDBERG  
TRACK EQUIPMENT**

An extensive railway system serves the Toquepala mine facilities. Nordberg equipment used by the contractor in laying rail included Power Jacks, Power Wrenches, Rail Drills, and a Hydraulic Spike Puller.



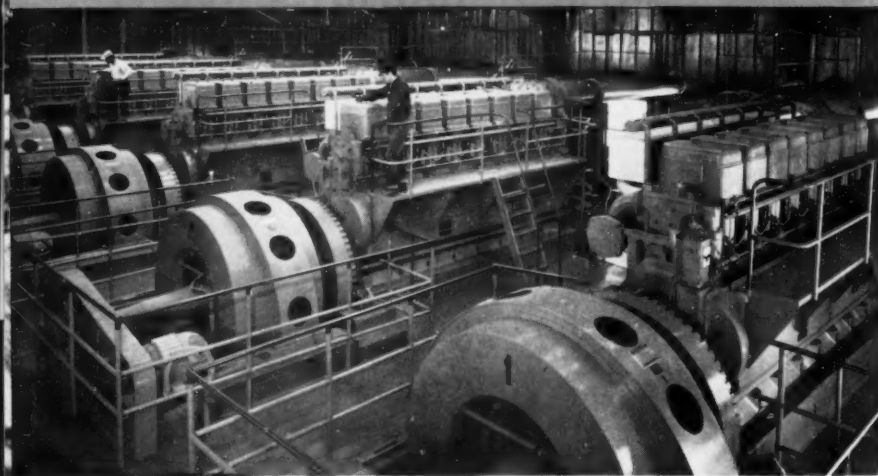
**SYMONS® CONE CRUSHERS**

Six Symons Cones handle secondary and tertiary crushing at the big Southern Peru Copper Corp. plant. Two of these are Standard units, and four are of the Short Head type.



**NORDBERG ENGINES**

Five Nordberg 4-cycle diesel engine-generator units are installed at the mine, 10,600 feet above sea level. Each of the 8-cylinder Nordberg supercharged engines is rated 1830 bhp, 1295 kw at their installed altitude.



M-250

©1960, N. M. CO.

• The huge Southern Peru Copper Corp. open pit copper mine at Toquepala, Peru, is one of the major new mining projects of this decade. It is now in production, after more than five years of planning and development through the combined efforts of four large metal mining companies. Each of

these companies have used Nordberg Machinery in their far-flung mining operations.

For, at Toquepala, as in most of the world's great ore and mineral operations, Nordberg Mining Machinery is playing an important part in the production of large tonnages of ore at low cost per ton.



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## Arizona

### Denver-Golden Joins Golconda Chemicals in Arizona Venture

Accelerated exploration of the Golconda Mining properties near Kingman, Arizona, will be undertaken as part of a joint venture by Golconda Chemicals Corporation of Kingman and Denver-Golden Oil & Uranium Corporation of Denver, Colorado. The property, about 12 miles north of Kingman, involves some 21 mining claims and includes the famed Golconda mine which is credited with a production record of over \$6,000,000 worth of zinc between 1908 and 1917, as well as silver, lead and gold.

Denver-Golden will direct exploration, development and mining of the property, while Golconda will handle processing of the ore. During the last three years, Golconda Chemical has devoted much of its efforts to the design and economics of a chemical manufacturing and marketing enterprise. The property was leased by Golconda in 1957.

Aerial, surface, and underground surveys will be undertaken by Denver-Golden before diamond drilling and drifting is started to delineate old or new ore bodies. If sufficient mineral reserves are blocked out by the exploration, Denver-Golden is expected to invest \$600,000 in completing the project. Operator of the Schwartzwalder uranium mine in Colorado, Denver-Golden is also engaged in a major exploration program on a gold property near Silverton, Colorado.

### Phelps Dodge Now Controls 494 Safford Copper Claims

All details in connection with the purchase of 299 unpatented mining claims in the Safford, Arizona, area have been completed by Phelps Dodge Corporation. The purchase price of approximately \$3,500,000 was negotiated with the owners two years in advance of the date of option held by Phelps Dodge since 1957.

This block gives the company control of 494 claims in the area, since Phelps

Dodge located 195 adjacent claims in 1957. The company has been exploring the property by core drilling under contract to Sprague and Henwood Drilling, Inc. of Grand Junction, Colorado.

The claims are in the Lone Star Mining district, approximately 10 miles north and a little east of the city of Safford. They are located in Sections 17, 20, 21, 22, 23, 26, 27, 28, 29, 33, 34 and 35 of Twp. 5S, R26 E.

The company considers the Safford claims and the copper ore to be an asset for the far-distant future, and does not contemplate undertaking any mining operations for many years. The mineralization is copper sulphides and the property will be an underground mine.

Hecla Mining Company, long established lead-zinc-silver producer in Idaho's Coeur d'Alene district, has established an exploration office in Tucson, Arizona, at 5101 E. Oak Street. J. D. Bell, exploration geologist with the company for the last 11 years, heads the office.

Ray Mines Division of Kennecott Copper Corporation topped several records during 1960, including total tonnage mined. In metallurgical operations, the sponge iron and acid plant had a record output of 20,492 tons of sponge iron with a metallic iron content of 8,560 tons, and a new high production of 32,093 tons of sulphuric acid. Continued efforts to outdo previous achievements are being carried out this year with plans for temperature control, better controls for furnace operation, improvement in the dust collection system, and better product quality through decreasing the amount of re-oxidation from the furnace through the cooler.

Colorado Fuel & Iron Corporation is using the most advanced methods for exploration of the tribal lands of the Fort Apache Indian Reservation to which it has exclusive mineral prospecting rights. R. R. Williams, manager of the firm's mining department; W. J. Schenler, chief mining engineer, and D. A. Carter, geologist, were among those on a recent inspection trip in the wilderness area where preliminary surveys indicate reserves of 10,000,000 tons of iron ore.

Reported deposits of asbestos, manganese and coal on the 188-square mile area will also be investigated.

A. J. Gilbert, Warren, Arizona, is mining and shipping quartz rock from the Nancy group of 13 unpatented claims located in Cochise County, about 11 miles northeast of Elfrida. A crew of 22 men, working two shifts five days a week, is employed, with production running about 700 tons daily. In this operation, loose, high-silica material (which has been eroded from higher up on the hillside and redeposited along its lower slopes) is mined and screened to furnish a high-silica flux for the Douglas smelter of Phelps Dodge Corporation. No drilling or blasting is required before the bulldozers excavate the material and push it to the screening plant, where it is passed over one-inch vibrating screens. About 40 per cent of the material is undersize (minus one-inch) and is rejected; the remaining 60 per cent (plus one-inch) is trucked to the smelter.

A group of 320 claims has been staked by Robert T. England, of Salinas, California, Charles R. Kimes, and associates, in the Owens district of Mohave County, Arizona. The property lies about 10 miles west of Artillery Peak and 50 miles south of Yucca, adjoining the old Cleopatra group. One hole, with a 2,000-foot objective, is being drilled under contract by Boyles Brothers Drilling Company and two additional ones are planned. This drilling is in an area northwest of the old Cleopatra pit, which is reported to have produced about 30 cars of crude copper-gold ore.

## California

Temescal Metallurgical Corporation has moved its offices and plant from Richmond, California, to nearby Berkeley, where a new electron beam furnace, the largest yet designed is under construction at the plant site. The new furnace, expected to be in operation by mid-March, will enable Temescal to produce super-purity metals such as tungsten, zirconium, and titanium, as well as cobalt and nickel alloys and specialty steels. The furnace will stand about three stories high and weigh approximately 25 tons. Temescal, which developed and perfected the electron beam process, plans to manufacture a new line of furnaces to be used for purposes other than casting and melting.

United States Borax & Chemical Corporation has reduced its operations at Boron, California, from a seven-day to a five-day operation, resulting in reduction of personnel by about 50 persons.

## Nevada

The Stardust Hotel in Las Vegas, Nevada, will be headquarters for the AIME Southwestern Mineral Industry Conference April 24 and 25. Among topics to be discussed are: "Recent Exploration for Asbestos in California", by Salem J. Rice of the California Division of Mines, San Francisco; "The Atlantic City Project", by S. H. Cohlmeier, Ronald C. Morgan and A. S. Henderson of Columbia-Geneva Division, United States Steel Corporation, Lander, Wyoming; "The Epithermal Type of Ore Deposit", by Dr. Harrison

### Drill Seeks Lithia From Nevada Dry Lake

Drilling by Leprechaun Mining and Chemical Company at its Silver Peak saline claims in Clayton Valley, Nevada, has shown nearly three times the lithia (Li<sub>2</sub>O) as that on which original estimates were based.

The deep exploration begun last August by E. J. Longyear Company of Minneapolis, Minnesota, consisted of three holes. Some 12 shallower upper horizon holes have been completed with two Leprechaun rigs. Pictured at right is the Longyear rig over hole No. 3.

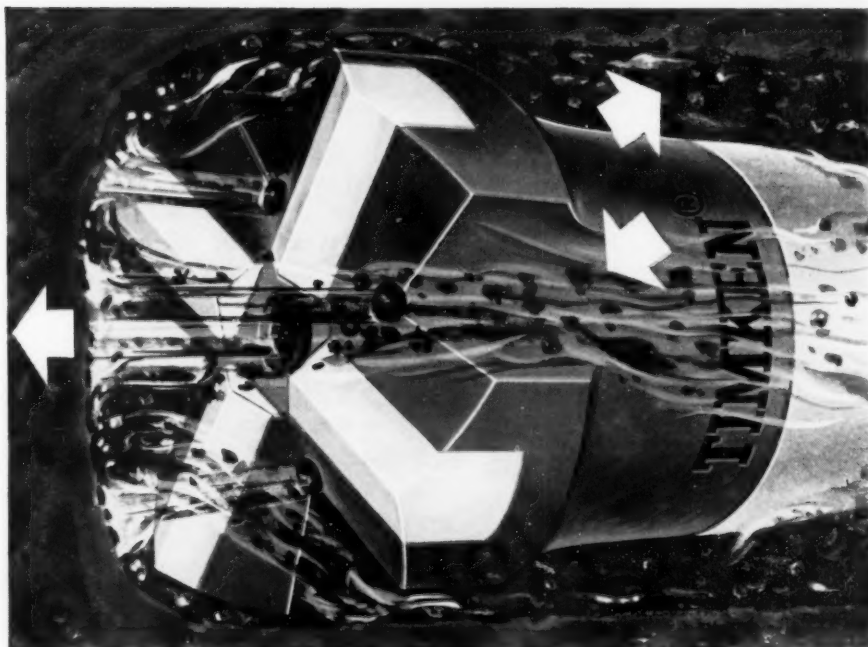
Leprechaun has also completed gamma-neutron salinity logs in five holes, under contract with the McCullough Tool Company of Bakersfield, California. The surface phase was scheduled for completion in January, while the drilling program continues.

The firm is now studying production process methods. Gerhard Pralle is field engineer in charge of exploration under C. P. Keegel, president and manager. Leprechaun headquarters are in Las Vegas, Nevada.



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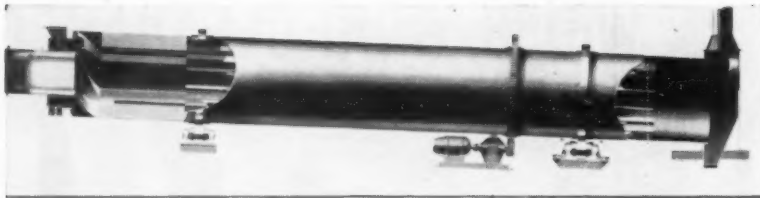
This Timken bit gives lowest cost per foot of hole when you can drill out full increments of steel.



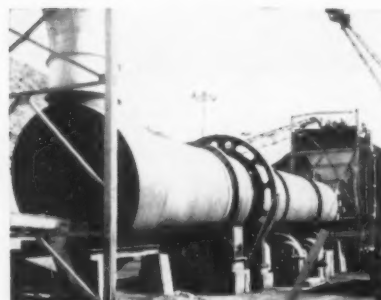
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Interior of shell of "XH" Ruggles-Coles Dryer showing lifting flights and feed spirals.



10' diameter, 80' long "XH" Ruggles-Coles Dryer drying bauxite in Jamaica.



Four 80" diameter, 60' long "XH" Ruggles-Coles Dryers handling asbestos ore in Canada.

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Complete specifications upon request. Ruggles-Coles Dryers are described in Bulletin 16-E-3.

## WHAT'S GOING ON . . . SOUTHWEST

A. Schmitt, consulting mining geologist, Silver City, New Mexico; "Industrial Minerals Development in the Central and Southern Rocky Mountains Region", Alfred L. Ransome, U. S. Bureau of Mines, Denver, Colorado; "Some Beryllium Occurrences in Western Utah and Vicinity", Norman C. Williams, Beryllium Resources, Inc., Salt Lake City, Utah; "An Engineer's Concepts of Carbonatites", Russell Wood, Molybdenum Corporation of America, Nipton, California; "Radioactivities Associated With Nuclear Explosives", Dr. Gary Higgins, Lawrence Radiation Laboratory, Livermore, California; "Economic Aspects of Interruption of Diamond Production in Congo Republic", Arthur F. Daily, consulting mining engineer, Oakland, California; "Underground Iron Mining in Nevada", G. W. De La Mare, Jackson Mountain Mining Company, Winnemucca, Nevada, and "Benefits Derived from Changeover to Trackless Equipment in a Flat-Lying Ore Deposit", Ray Schultze, See-Tee Mining Corporation, Grants, New Mexico.

## New Mexico

New safety records have been achieved by two uranium firms at their New Mexico operations. The **Anaconda Company** employees at the company's **Bluewater** uranium reduction mill completed eight consecutive months without a lost-time accident, while the firm's **Jackpile** mine on the Laguna Indian reservation was well into its fourth consecutive month without time lost because of accidents. The mill had formerly recorded five accident-free months in succession, while the mine's previous record was for two and a half months. Employees of **Home-stake-Sapin Partners** recently completed three months of work without a lost-time accident at the company's three mines and uranium processing mill in the Ambrosia Lake district.

A recent report by the sub-committee on management of the governor's special committee on mine safety in New Mexico detailed several steps that have been taken to prevent accidents in uranium mining. A group designated as the **Uranium Operators' Safety Council** has been given full support by uranium mining firms who employ over 98 percent of uranium mining and milling workers in the Grants, New Mexico area. Highlights of the report include: intensive safety training for over 210 supervisors with results of the instruction already evident; roof bolt tests are being made by a number of operators; a school in radiation hazards has been held; the **U. S. Bureau of Mines** has begun its study of rock mechanics in this area; the number of qualified instructors in first aid has been increased; instruction in mine rescue procedure has been completed by 50 employees in the area; a detailed study of 28 mine fatalities in the area was made, resulting in 18 recommendations for prevention of similar accidents; a list of 10 basic safety rules was compiled; safety incentive programs are being studied by firms that do not now have them, and many operators have established labor-management committees to study safety practices.

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## Mifflin Mining Reorganized, Reopens Wisconsin Operations

Assets of the Mifflin Mining Company, Inc., have been purchased from Herb Turner, Jr. of Boscobel, Wisconsin, and the firm reorganized under the same name. John F. Howland, president, and Walter Hennes, vice president, head the reorganized concern.

The property includes the 150-ton-per-day Coker mill adjacent to New Jersey Zinc Company's Coker property northeast of Rewey, in Iowa county, Wisconsin; the Dinsdale mine, northeast of Galena in Joe Daviess county, Illinois, and the headframe and other equipment at the Rasque mine, south of Platteville in Grant county, Illinois.

The mill has been reconditioned and the flow sheet revamped to by-pass the gravity separation unit. The Coker No. 1 mine and open pit have been dewatered and ore is being mined under lease from New Jersey Zinc and from extensions under lease from LaVerne Bickford of Rewey, Wisconsin. Ore is loaded by a Case TerraLoad'r underground into trucks that haul it directly to the crushing unit of the mill.

Ore is crushed to 90 percent minus- $\frac{3}{4}$  inch and fed to the ball mill to be ground to minus-65-mesh. A four-cell unit of Denver Equipment Company Special 18 flotation cells removes lead from the pulp which is then conditioned for the zinc circuit, consisting of two banks of Denver Equipment Company No. 18 cells, one bank of six cells, and one bank of four cells. Lead is finished on a shaker table, zinc on a two-disc, six-foot Eimco filter. Zinc concentrates are shipped to the Eagle-Picher plant at Galena, Kansas.

Additional land under lease by Mifflin Mining Company makes a total of 1,500 acres.

## Philadelphia Symposium On Agglomeration Is April 12-14

Technical papers from agglomeration experts in nine countries will be heard by the several hundred participants in the First International Symposium on Agglomeration April 12 to 14. Countries to be represented at the session in the Sheraton Hotel, Philadelphia, Pennsylvania, include the United States, Canada, Australia, South America, England, Scotland, Germany, Sweden, and Japan. Some 85 persons from other countries are expected to attend the symposium sponsored by the AIME and its three constituent organizations.

Overall theme of the session, designed to provide cross-pollination of ideas and action on an international basis, is agglomeration in all phases of sintering, pelletizing, nodulizing, briquetting, powder metallurgy and other aspects, as related to ferrous-non-ferrous-metallic and non-metallic minerals.

During the symposium's seven sessions, 36 technical papers will be presented. Among them are: Properties of Sinter Smelted in the Electrothermic Zinc Furnace, Advances in Balling and Pelletizing, Preparation of the Raw Material Charge in the Sintering of Lead Concentrates, The Effect of Sintering on the Oxidation Rate of Zinc Sulphide, Engineering Contributions to New Techniques of Iron Ore Agglomeration, and The Basis of Sinter Plant Design.

Other subjects of interest to be discussed include: Applications of the Con-

tinuous Sintering Process, Automation of the Dwight-Lloyd Type Sintering Machine and Some Consideration on the Properties of Sinter, The Combustion Zone in the Iron Ore Sintering Process, Heat Hardening of Artificial Magnetite Pellets, A Comprehensive Study of Iron Ore Pellets Made from Specular Hematite, Effects of Lime and Magnetite Concentrates, Structures and Bonding Mechanisms in Sintere Made from Fine-Grained Australian Hematites, and Pelletizing on a Horizontal Grate Machine.

Official language of the symposium will be English, but French and German interpreters will be on hand.

## Rock Mechanics Symposium At Penn State March 30-April 1

Five technical sessions are scheduled for the Fourth Symposium on Rock Mechanics to be held March 30 through April 1 at University Park, Pennsylvania under the sponsorship of the departments of mining of Colorado School of Mines, University of Minnesota, University of Missouri School of Mines and Metallurgy, and the Pennsylvania State University.

Papers to be presented at the symposium include "Michigan Mines Subsidence Case Histories" by Buron H. Boyum of Cleveland-Cliffs Iron Company, Ishpe-

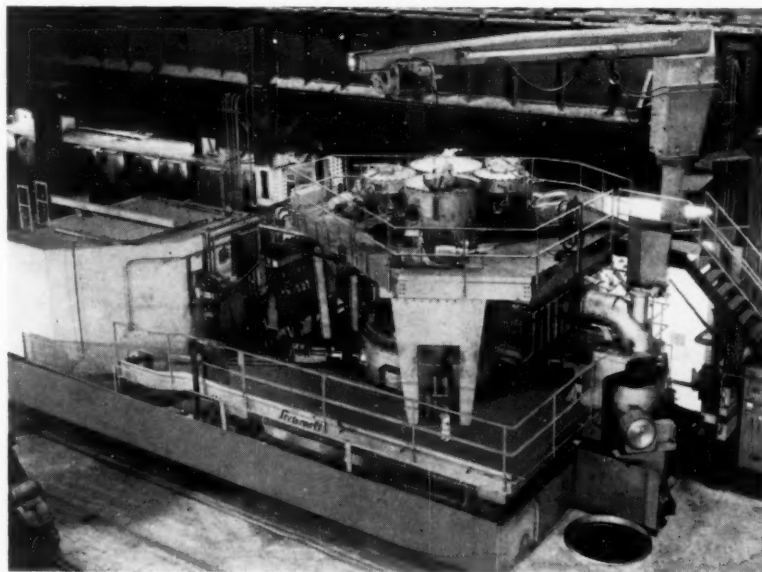
ming, Michigan; "Subsidence Due to Mining—A Case History" by Don V. Deere, University of Illinois, Urbana; "Methods for Determining Rock Pressure", Louis A. Panek, supervisor of physical sciences, U. S. Bureau of Mines Metallurgical Center, College Park, Maryland; "The Natural Arch, Fracture Pattern and Sequence of Failure of Massive Rocks Surrounding an Underground Opening", Clifton W. Livingston, Barodynamics, Inc., Georgetown, Colorado, and "Rib Control of Bedded Roof Stresses", Lawrence Adler, Michigan College of Mining and Technology, Houghton.

Discussion sessions will follow the presentation of each of the many papers at the meeting. A buffet supper and a banquet are among social events planned.

## Central

National Lead Company closed operations at its underground lead-copper-nickel-cobalt mine and 1,450-ton flotation mill at Fredericktown, Missouri, on January 31. The refinery is expected to continue operations on a month-to-month basis treating stockpiled material.

The Athletic Mining and Smelting Company has resumed operations at its zinc smelter in Fort Smith, Arkansas,



## Crucible Steel Tests Vacuum Degassing Unit

An experiment described as a journey into the unknown is under way at the Midland, Pennsylvania, works of Crucible Steel Company as it tests a vacuum degassing unit from Europe and its effectiveness with highly alloyed steels. The Crucible unit is the first of its type to be used in this country, although a similar smaller unit is being applied in West Germany to carbon steel production. As a leader in specialty steels, Crucible is interested in evaluating the degassing unit's contribution to that type. Essentially these units were designed to give a quality level above that of air melting by open hearth or electric furnace, but somewhat lower than vacuum melting. Crucible teams investigated three types of degassing units and decided to use the Dortmund-Holder-Huttenunion process because it offers more complete mixing and therefore more complete degassing. It also provides for adding alloying elements under vacuum. Aside from planned additions made during the process, the chemical changes which occur in the process are: (1) hydrogen is removed, (2) virtually all oxygen is removed, (3) a large portion of the nitrogen is removed, (4) the carbon is lowered and since it acts as a deoxidant the oxygen is removed as carbon monoxide and carbon dioxide, and (5) some manganese is lost during the cycle. The Crucible unit was built by Lectromelt Division of McGraw Edison Company, licensee of Dortmund-Holder-Huttenunion A. G.

Results so far are generally encouraging.

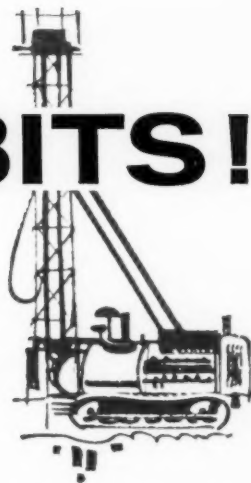


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## WHAT'S GOING ON . . .

### CENTRAL AND EASTERN

which was closed in January, 1960, because a Federal quota order limited zinc imports. The plant is now operating at about 40 percent of capacity, with 150 employees called back to work.

Shaft No. 1 at the **Pea Ridge**, Missouri iron mine of **Meramec Mining Company** is now more than 2,300 feet deep, while Shaft No. 2, first of the ore shafts, had reached 1,975 feet by the end of January. Five diamond drills are being used in the exploration program. The Missouri Pacific Railway has begun once-a-week service to the mine on its newly-built spur line from Potosi to Pea Ridge. The mine is scheduled to go into production early in 1963.

## Eastern

**PCE Explorations Ltd.** of Toronto, Canada, is investigating recently acquired manganese holdings in South Carolina where chip samples taken on outcrops assayed from 6 to 20 percent manganese representing widths up to 400 feet. Deposits are in a belt of banded sedimentary manganese-bearing rocks in widths from 1,000 to 2,000 feet with zones of manganese oxide in the richer bands ranging between 100 and 400 feet wide. The zones have been traced by intermittent outcrops for over four miles on the property leased by the Canadian firm. Softness and friability of the zones

resulted in failure to recover representative core or sludge samples by diamond drilling. The drilling of three holes, however, indicates that the manganese oxidation goes below 100 feet and that open pit mining may be possible. Other diamond drilling methods are being considered for the purpose of metallurgical testing and obtaining more conclusive values. Proving of tonnage grading about 15 percent manganese on the average is hoped for by the company which has several gold, base metal, nickel, and oil properties in Canada.

In preparation for start of mining soon, post-sinking-grouting operations are under way at the **Lake Erie** salt mine of **International Salt Company** near Cleveland, Ohio. The work is being carried out by the **Cementation Company (Canada) Ltd.**, which was also responsible for the grouting. International Salt in 1957 signed a 50-year contract with the state of Ohio for the off-shore operation, where a production of 1,000,000 tons of salt a year is expected.

A second potline at the Alcoa, Tennessee, smelter of **Aluminum Company of America** has been shut down, leaving seven potlines now in operation. G. H. Traylor, smelting works manager, said the curtailment was made necessary by metal production in excess of current demands.

An expansion of its phosphate flotation pilot plant east of Lakeland, Florida, by **Smith-Douglass Company** has doubled the original capacity of 50 tons of phosphate rock per hour, supplied from the firm's **Tenoroc** mine. The expansion is the sec-

ond phase of a project to establish a full-scale production plant using the new Hollingsworth-Sapp process introduced last year. The process permits up to 95 percent recovery of phosphate; considerable savings in equipment and operating costs; reduction of space requirements, and lower maintenance expenditures.

Tennessee continues its lead as the nation's most important zinc producing state, with an output of 91,000 short tons during 1960, compared with 89,932 tons in 1959, a previous record year. High production of copper and pyrite also highlighted the year, with copper production increasing 13 percent over 1959. Total mineral production for the year showed a 2 percent increase over 1959.

A diamond drilling program has been started near Luttrell, Tennessee, by **New Jersey Zinc Company**, prospecting for zinc ore. The drilling is southwest along the Copper Ridge outcrop belt on which the company's **Treadway** mine is located.

The current low price of zinc has caused a suspension of all diamond drill exploration in the Mascot-Jefferson City, Tennessee, zinc district. **Joy Manufacturing Company**, only contract driller in the district, has closed its Jefferson City office. Most of the drillers were transferred to Missouri where an extensive iron ore exploration program is under way.

Bauxite production in the state of Alabama increased 14 percent during last year, according to the **U. S. Bureau of Mines** 1960 mineral survey. Tonnage of ore mined was 4,600 tons.

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## Iron Ranges

Operations of Copper Range Company at its White Pine copper mine in Michigan will reach a break-even point if output can be sold at not less than 29 cents a pound, according to James Boyd, president of the firm. Costs include 2 cents a pound for interest charges and 1½ cents for current development projects. If the company maintains its production quotas of about 50,000 tons a year or 90 percent of capacity, there should be a potential savings in cost from its recent activities in the order of 4 cents a pound, Mr. Boyd said. The company's new Southwest ore body is expected to reduce the cost of producing a pound of copper by another six cents, he said. Located in 1959, the Southwest ore body is now under development, with partial production expected to begin in 1962 and full production early in 1964. It lies about 2,000 feet below the surface, two miles southwest of the White Pine property, and the ore is about 50 percent higher in grade than at that deposit. Although there is some risk involved, as in all mining operations, Mr. Boyd said that if the Southwest lives up to expectations and the copper market is favorable, the company will install new equipment at that mine and expand the present mill and smelter at White Pine to handle output from both ore bodies. If the market in 1962 will not stand additional production, mining equipment will be moved from the present workings to the new mine, leaving the mill and smelter as they are. Copper Range recently suspended operations temporarily at its mine in Champion, Michigan, putting it on a standby basis, and is concentrating production at White Pine.

Wisconsin's iron ore production and shipments during 1960 were 1,500,000 long tons, about the average rate for the last 20 years, while production of lead and zinc increased considerably.

Shipments of concentrates from jaspilite made during 1960 in Michigan reached an all-time high, representing about 10 percent of the state's total iron ore shipments. Total iron ore shipments for the year are estimated at 10,750,000 long tons, compared to 7,247,449 in 1959.

The 37th annual conference of the Lake Superior Mines Safety Council will be held May 25 and 26 at the Hotel Duluth in Duluth, Minnesota.

All 52 employees of the Jessie mine, operated by the Jessie H. Mining Company, have completed the U. S. Bureau of Mines metal mines accident prevention course. This marks the first time that 100 percent of the employees of any Mesabi Range mine have completed the course.

The geology division of the Northern Pacific Railway Company has opened an office in Hibbing, Minnesota, as headquarters for continuing geologic studies and related investigations on its properties in the area, as well as lease inspection work. Layton C. Binon, mining geologist for the company's iron ore properties in the region the last several years, is in charge of the Hibbing office, established to bring all the company's mining properties under uniform management and to maintain closer direct contacts with lessees.

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## Idaho

### Bunker Hill Steps Up Five-Year Program for Mining, Metallurgy

A five-year stepped-up development program got under way recently at the 75-year-old Bunker Hill lead-zinc-silver mine at Kellogg, Idaho. The Bunker Hill Company, following settlement of a record-breaking labor strike that lasted seven and a half months, is also pushing ahead on full production schedules despite lead-zinc price declines.

The company has started producing phosphoric acid at its new \$2,000,000 plant which has a capacity of 130 tons daily and will be operated around-the-clock. Production of anhydrous liquid phosphate in a \$225,000 plant addition built by Collier Carbon and Chemical Corporation of California was scheduled to start in mid-February.

Construction work is resuming on a new assay laboratory, and a new sintering plant is on the design boards to replace roasters at the Bunker Hill lead smelter. Improvements are also being designed for the preparation and feeding of charge materials into the blast furnace.

Work is being started on a sand-fill system in the mine, with July 1 as the target completion date. New 10-ton skips will be substituted for the present 8-ton skips to hoist waste rock formerly used for fill. The development work will be concentrated in easterly and northerly extensions of present deep levels to include the Yreka and Stewart areas held under operating agreements with Yreka United and Silver Bowl mining companies. The Yreka area will be penetrated from two horizons—400 feet below sea level and several hundred feet above. Additional work will be

done in the Stewart area from three levels above sea level and a new below-sea level bore started.

C. E. Schwab is company president; Joe Gordon, manager of mines; Roger H. McConnel, chief geologist, and A. Y. Bethune, manager of metallurgy.

**Clayton Silver Mines** is starting a diamond drilling program to explore walls of existing working levels at its Clayton mine, Custer County, Idaho. Meanwhile, it is developing north end stopes on the 800 level and stoping remaining ore above the 500 level. Production is running about 100 to 110 tons of lead-silver ore daily. W. M. Yeaman, Yakima, Washington, is company president and Norman M. Smith, Kellogg, Idaho, general manager.

**Coeur d'Alene Mines Corporation** is reopening the 1,000-foot level of its shaft preparatory to diamond drill exploration of the adjoining **American Silver Mining Company** claims under a profit-sharing agreement. The property is located in the Silver Belt of the Coeur d'Alene mining region, Shoshone County, Idaho. Dr. H. C. Mowery, Wallace, Idaho, is president of the operating firm, and J. M. Henneck of Spokane is president of American Silver.

Production of elemental phosphorus, high analysis phosphatic fertilizers, and calcined phosphate rock has been resumed by **Central Farmers Fertilizer Company** at its \$16,000,000 plant in Georgetown, southern Idaho. The plant had been shut down for several weeks to permit a major overhaul of electric furnaces and repairs to other equipment. Capacity of the Georgetown plant is about 46,000,000 pounds of phosphorus per year which is used to produce phosphoric acid. This is then acidulated with phosphate rock to

produce fertilizer. In addition to fertilizer and calcined phosphate rock, the firm will also sell elemental phosphorus.

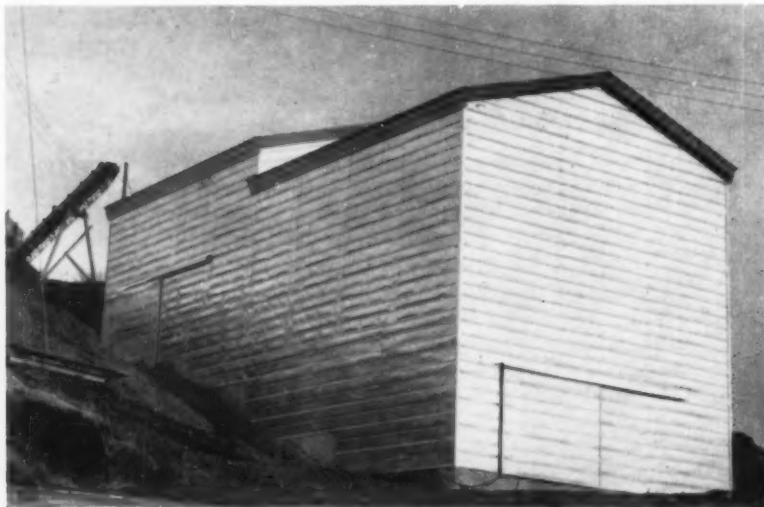
**Index-Daley Mines Company** has budgeted \$4,800 for purchase of milling equipment, \$2,200 for mine supplies and \$7,000 for payroll out of returns from an assessment of 1 cent a share levied recently. The firm is operating in the Hailey district, Blaine County, Idaho. Charles S. Woodward and William J. Orton, both of Salt Lake City, Utah, are president and treasurer, respectively.

The **Galena** mine west of Wallace, Idaho, in the Coeur d'Alene district's silver belt, the nation's No. 2 silver producer last year, is nearing mill capacity of 500 tons daily following settlement of a seven-month labor strike. A new ventilating shaft has been sunk 400 feet and two new exploration bores started. One will test the upward extension of a new high grade but narrow vein found north of the Polaris Fault at a depth of 3000 feet. It will be driven from the 2800-foot level. The other will be driven from 3200-foot level workings. The mine is owned by **Callahan Mining Company**, and operated under long-term lease by **American Smelting and Refining Company, Day Mines, Inc.**, Wallace, has a 25 per cent working interest in the lease.

**American Smelting & Refining Company** resumed mining and milling operations at its **Page, Galena**, and **Jack Waite** mines following the signing of a new three-year contract which ended a strike of nearly seven months by the **International Union of Mine, Mill and Smelter Workers**. The walkouts affected 500 men in Idaho's Coeur d'Alene mining district.

**Atlas Mining Company** is maintaining the main working and ventilation tunnels at its property east of Mullan, Shoshone County, Idaho, in anticipation of additional exploration of its large holdings which extend to within a few hundred feet of the famed **Lucky Friday** vein on the north. Growth of the **Lucky Friday** mine has increased interest in adjacent properties. R. W. Greenough, Mullan, Idaho, is Atlas president.

At the **Dayrock** lead-silver mine north of Wallace, Shoshone County, Idaho, a new vein (the **Hornet**) found about a year ago on the 1,100-foot level has been developed in ore for 435 feet and a raise driven to the 950 level in ore. **Day Mines, Inc.**, is the owner.



### Washington Tungsten Mill Starts Test Operation

Production tests are scheduled to start soon at this gravity-type tungsten mill completed recently five miles south of Spokane, Washington. Two jigs and four Diester concentrating tables have been installed at the mill, which has a capacity of 150 tons of ore each 24 hours. A 200,000-gallon earth reservoir has been bulldozed to hold water from a 400-foot well drilled on the property. A 150-ton coarse ore bin and conveyor system have also been constructed. A large stockpile of ore has been accumulated through trenching and open-pit work. The mill was built by H. Halvorson, Inc., Spokane construction firm which will operate it. The firm has an interest in the property on Silver Hill, once the site of a tin-mining venture. Carl A. Coon of Spokane is the principal owner.

## Montana

Discovery of a rare mineral—fermsite—in Montana has been announced by the U. S. Bureau of Mines, which identified it during a routine analysis of a specimen at one of its Albany, Oregon, laboratories. A columbium mineral, unusual because it is free of tantalum, fermite had previously been found only in Russia. It was first located in 1946 in the Visheve mountains of the central Urals. The Montana specimen was found in the Bitterroot mountain of Ravalli county.

The **F & S Contracting Company** of Butte, Montana, has been given a new contract for stripping waste at the Berkeley Pit of **The Anaconda Company** in Butte. The Berkeley is Anaconda's prime source of low-grade copper ore. Current output is about 30,000 tons per day.

Open-pit and underground barium mining operations are being carried on northeast of Missoula, Montana by **Baroid Division, National Lead Company**. Employment varies from 5 to 30, depending upon the season. Mill capacity is 8 tons an hour. Markets have been developed in the seven northwestern states. James Murphy is manager.

Two firms recently incorporated in Montana are **Mill Creek Mining Company** and **Peura and Shute Inc.**, of Jefferson City, both capitalized for \$50,000. The latter firm was granted the right to acquire and operate mines.

All interests of **Webb & Knapp, Inc.** of New York in the Anaconda, Montana, project to produce steel from waste copper smelter slag have been transferred by that firm to its subsidiary, **Gulf State Land & Industries** of New Orleans, Louisiana. The transfer is being made in order to place the steel project, which is now in its last planning stages, under separate management in a company distinct from the bulk of Webb & Knapp's real estate enterprises, and one that is engaged in industrial and mineral development. Webb & Knapp's contract to purchase slag from **The Anaconda Company's** 40,000,000-ton pile plus all future production from the smelter at 25 cents a ton, and other agreements involving the site, auxiliary facilities, and material for the plant are transferred to Gulf State; as are agreements with steel manufacturers to purchase over one-third the output of steel ingots of the new mill, and a contract to supply 150,000 kilowatts electricity for the mill from the Bonneville Power Administration. Webb & Knapp has also transferred its interest in development of the new Strategic-Udy metallurgical process that it has developed with the **Strategic Materials Corporation** of New York and the **Koppers Company** of Pittsburgh, to reduce the iron ore from the slag.

## Washington

A hydraulic prop which can support up to 75 tons of rock pressure in underground mines has been developed at the **U. S. Bureau of Mines' Spokane Office** of Mining Research. It is being tested in the **Luke phosphate mine** near Avon, Montana. The prop, weighing 63 pounds with hydraulic fluid, has a relief valve which enables it to yield as the maximum load is reached.

Harold Hightower of Inchelium, Washington has opened a road to old upper workings of the **Silver Leaf mine** in the Enterprise mining district, Ferry County, Washington, has renovated buildings and done bulldozer stripping. More work is planned in the spring.

**Cle Elum River Mining Company**, which is developing properties in the Camp Creek areas of Kittitas County, Washington, has acquired control of three more molybdenum claims within a few miles of the mill being built by the firm near Camp Creek. The company plans to diamond drill beneath a surface exposure 600 feet long and 50 feet wide which has been prospected by open cuts. Grab samples have assayed as high as 1.35 percent molybdenite.

Washington's 1960 over-all mineral production increased 2 percent in value with the increased output of gold, silver, uranium, and zinc more than offsetting

a decrease in lead among the metal mining group. The five mines that supplied nearly all the metal production were **Knob Hill** (gold-silver, Ferry County), **Gold King** (gold, Chelan County), **Pend Oreille** and **Grandview** (lead-zinc, Pend Oreille County) and **Midnite** (uranium, Stevens County).

Extensive stripping is planned by Harold G. Badgley and W. A. Nations on eight claims leased in the **Republic** gold camp from **Day Mines, Inc.**, Wallace, Idaho. The claims, which include such early-day producers as the **Jim Blaine, Republic,** and **Princess Maud** mines, are three miles south of Day Mines' **Gold Dollar** mine which is being operated by **Knob Hill Mines, Inc.**, from its deep workings. The Republic camp is in Ferry County, Washington.

## Alaska

Industry observers believe that **Columbia Iron Mining Company**, division of **United States Steel Corporation**, will exercise its option due March 1 on the large Alaskan magnetic iron ore property of **Klukwan Iron Ore Corporation**, a subsidiary of **Quebec Metallurgical Industries, Inc.** A four-year option on the property, which is 22 miles up the Chilkat River from Haines, Alaska was extended last year. The original agreement gave Columbia the right to lease the property on an annual royalty basis, or purchase it outright for \$10,000,000. In addition to a drilling program, Columbia has conducted metallurgical tests on bulk samples of ore, and for a time produced several thousand tons of concentrates

from a small pilot plant. During 1960, a churn drilling program was conducted on a 102-claim placer magnetite property and diamond drilling on 108 magnetic lode claims. These programs were completed in December but results have not been made public. Estimates by Klukwan some time ago put recoverable iron from the placer property alone at over 100,000,000 tons of 60 percent iron concentrate. At one time the titanium content of the concentrates caused concern.

An exploration office is being opened in Anchorage, Alaska, by **Bear Creek Mining Company, Kennecott Copper Corporation** subsidiary, as a step toward intensification of its work in this state. George A. Moerlein is in charge and will represent Bear Creek in all its Alaskan business except for its exploration at the Rubry Creek copper property. For the present his address is at his home, 1413 Valarian, in Anchorage.

The **Far North Mining Company** at Candle, Alaska, will not be in operation this year. The operators, Fred Parker and Jack Raymond, are in South America to investigate mining properties.

A report about the geologic interpretation of magnetic data in the Copper River basin of Alaska has been released in open files by the **United States Geological Survey**. The report may be seen at Brooks Memorial Building, College, Alaska; at 117 Capital Building and Room 317, Alaska Office Building in Juneau, and 503 Cordova Building, Anchorage. Those who wish to use the text for reproduction may see copies at 345 Middlefield Road, Menlo Park, California.

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# INTERNATIONAL NEWS

## Union Miniere's Copper Output For 1960 Exceeds 1959 Total

Despite recurrent political upheaval in the Congo, Union Miniere du Haut Katanga's production of copper in 1960 exceeded that of 1959, as did output of zinc, germanium, and cadmium. Copper production for the year was 300,704 metric tons, while in 1959 it totalled 280,403 tons. Although the present production rate is higher, the 1961 average is expected to be about the same, because of lower copper demand.

Germanium production of 26,100 kilograms was nearly double the 1959 figure of 13,643 kilograms. Other production figures for last year in metric tons (with 1959 figures in parentheses) include: cobalt, 8,240 (8,431); zinc concentrate, 192,000 (118,000); cadmium 244 (99), and uranium oxide, 1,079 (2,110). Uranium oxide production is expected to cease about the end of March since both reserves at the Shinkolobwe mine and the company's uranium ore stocks will be exhausted. Silver production decreased slightly, amounting to 124,100 kilograms in 1960, compared with 148,307 in 1959.

Union Miniere's 1961 plans call for drawing up a 10-year spending program, with an expenditure of about \$20,000,000 annually for capital projects, expansion and modernization programs, which is about the rate allocated in recent years.

Activities of companies associated with Union Miniere are described as normal for the past year. A subsidiary, Societe Metallurgique du Katanga (Metalkat) produced 53,358 tons of electrolytic zinc in 1960, compared with 54,810 tons in 1959.

## Kennecott Sells African Gold Mines to Engelhard Syndicate

Purchase of Kennecott Copper Corporation's interest in two South African gold mines by a syndicate-formed company which Charles W. Engelhard heads will give Kennecott a 20 percent interest in net income and capital gains of the purchasing company as well as about \$10,000,000 to be paid in five equal annual installments. (SEE MINING WORLD, February 1961, page 61.)

Kennecott's total investment in the two mines—Virginia Orange Free State Gold Mining Company and Merriespruit (Orange Free State) Gold Mining Company amounted to some \$46,000,000, including debenture and loan stock. Interest and redemption payments received were approximately \$3,914,000.

Maximum amount Kennecott can receive under the 20 percent provision of the sales agreement is approximately \$7,000,000. However, it will have the right to acquire 20 percent of the out-

standing stock of the purchasing company upon cancellation of the 20 percent interest, with no future advances or investment.

The syndicate is composed of Rand Mines Ltd. of Johannesburg, of which Mr. Engelhard is chairman; Anglo-American Corporation of South Africa Ltd.; Anglo-Transvaal Consolidated Investment Company Ltd.; Centramic (South Africa) Ltd., and Engelhard Industries of Southern Africa Ltd. Some of the syndicate members have important holdings in the Harmony mine adjacent to the Virginia mine and an arrangement may be developed which would be beneficial to both in the mining of ore, underground transportation, ventilation, water control and pumping.

Entering the Orange Free State gold mining area in 1947, Kennecott acquired 33.6 percent (later increased to 35) of the Virginia property and a 34 percent interest in Merriespruit in 1950. Shaft sinking at both mine sites began that year and outlay for mine development and surface facilities was extensive. However, the ore at the Virginia mine did not prove to be as rich in metal content as originally expected, while production at Merriespruit, begun in March, 1956, ceased in November because of unprecedented flooding. Cost of de-watering the mine and the disappointing gold values did not warrant putting the Merriespruit back in operation.

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## Africa

**UNION OF SOUTH AFRICA**—The United States Atomic Energy Commission has revised its uranium concentrate purchase program with South Africa, but will buy the same amount—18,900 tons up to December 31, 1966—as under the previous arrangement. The previous contract was through the **Combined Development Agency**, principally a joint United States-United Kingdom agency. The new contract, which changes delivery schedules somewhat, will be at a fixed price averaging approximately \$11.20 per pound, about 60 cents per pound less than under the CDA formula arrangement. A small quantity of  $U_3O_8$  originally scheduled for 1961-1962 delivery will be delivered in the post-1962 period. It is expected that those South African uranium producers with considerable amounts of accumulated uranium-bearing residues from gold extraction will continue to treat such slimes where uranium oxide is the principal product, but will suspend mining of uranium ore.

**NIGERIA**—A group of influential Nigerians has formed the **Industrial Promotion and Development Company of Nigeria**, which is expected to play an active part in the rapid industrial development foreseen for this country in the next decade. The firm has retained, both locally and overseas, a panel of industrial consultants to study proposals submitted to the company for financing either alone or with other domestic or foreign groups. Directors include Chief C. O. Ogunbanjo, Jaiyeola Maja, Kabiru Bayero, who is the Member of Parliament for Kano, and Godfrey O. Aghadiuno.

**UNION OF SOUTH AFRICA**—**African Metals Corporation Ltd.** has extended its program of exploration for base metals to the Saldanha Bay area, north of Cape Town.

**FEDERATION OF RHODESIA & NYASALAND**—The General Council of the European Mine Workers Union has ratified the decision of its members to accept the African advancement proposals of the Mining Joint Industrial Council. These proposals are based on a "job ladder" open to all races and on the basis of merit and rate for the job. The next step will be discussions between mining companies and the African Mine Workers Union. Initially 350 European employees will be affected by this African advancement.

**UNION OF SOUTH AFRICA**—Development of a sixth open pit face has been started by **Phosphate Development Corporation (Pty.) Ltd.**, which had made 479,000 tons of ore available for mining by mid-1960. By blending mined products from various points of its Transvaal operations, the company has supplied a fairly constant grade of ore, averaging 10.5 percent  $P_2O_5$ , to the mill at a tonnage of 773,209 through 1959-1960. Plant modifications and installation of more flotation cells increased output of concentrate from 88,675 to 146,100 tons. Most recent results of the continuing drilling program show that, to a depth of 200 feet, some 70,000,000 tons of pyroxenite ore averaging 7.5 percent  $P_2O_5$  are available. A mine face has been opened to supply ore to a small pilot plant for beneficiation experiments.



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# International Nickel Selected Marcy Mills for its new Levack Plant

Inco's new 6000 ton per day Levack Mill, in the Sudbury district of Canada, features extensive use of automatic and remote controls designed for maximum efficiency to offset rising costs.

The company states that: "The experience gained from its Copper Cliff and Creighton mills, operating since 1930 and 1951 respectively, proved of great value in designing the Levack Mill." Marcy Mills are used at both Copper Cliff and Creighton.

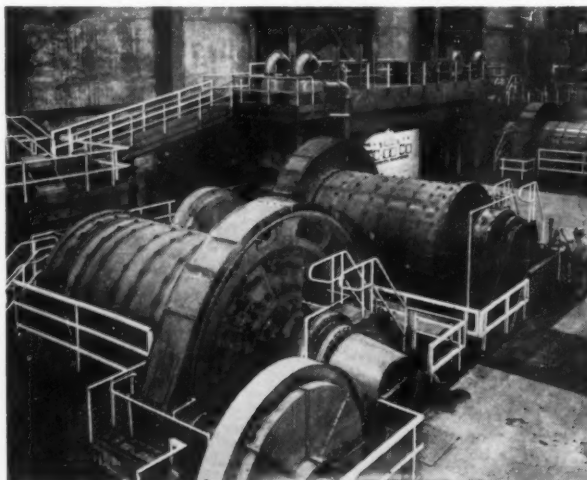
## INCO HAS PURCHASED A TOTAL OF 61 MARCY MILLS

International Nickel Company of Canada, Ltd., world's largest producer of nickel, has purchased a total of 61 Marcy Mills including the four at Levack.

## TYPICAL EXAMPLE OF MINE AND SMELTER'S WORLDWIDE SERVICE

Canadian Vickers, Ltd., Montreal, Mine and Smelter's sales agent and licensed manufacturer for Marcy Mills in Canada, in cooperation with International Nickel and Mine and Smelter, manufactured and serviced the Marcy Mills for Levack.

PHOTO COURTESY INTERNATIONAL NICKEL



**LEVACK MILL.** Photo shows one of the two grinding sections. Each section includes one 10' x 15' Marcy Rod Mill and one 10' x 14' Marcy Ball Mill. Central instrument panel controls entire grinding operation.

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## Canada

### 1961 Program at Wabush Iron Project To Cost \$20,000,000

A \$20,000,000 construction program will be started in two Canadian provinces this year by Wabush Iron Company Ltd. in connection with the Wabush Lake iron ore project. The project will include facilities required for the further development of large-scale mining, processing and housing installations for the production of high grade iron ore concentrates at the company's Wabush Lake, Labrador, property.

In the vicinity of Pointe Noire, Quebec, where the ore will be loaded for shipment on the St. Lawrence River, west of Sept Iles, a 25-mile railroad will be built, an area dredged for construction of an ore loading dock, an ore storage area will be prepared at the dock site, and the building of service facilities will be started. This phase of the work will cost in excess of \$15,000,000.

Preliminary investigation at the property, which has been under way since 1957, will include continued operation of the preliminary iron ore processing plant and further exploration drilling of the ore body. Shipments of high grade iron ore concentrates from the plant, for sintering and blast furnace tests, have totalled about 42,000 gross tons to date.

Drilling of the orebody, of which 32,000 feet has been done up to now, will continue to determine ore characteristics for future development and operation of the mine.

Wabush Iron Company is presently owned by the Steel Company of Canada, Ltd., the Youngstown Sheet and Tube Company, Interlake Iron Corporation, Inland Steel Company, Pittsburgh Steel Company and Pickands Mather & Company, which is also managing agent.

**SASKATCHEWAN**—In the shaft sinking program at its Esterhazy potash property, **International Minerals & Chemical Corporation (Canada) Ltd.**, has reached the limestone strata under the water-impregnated Blairmore sand formation. The limestone bed was encountered at a depth of 1,435 feet below the shaft collar. The European technique of tubbing was used for the first time in the Western Hemisphere in placing a cast-iron lining between the 1,200 and 1,500-foot levels of the shaft to wall off the Blairmore sands. This was combined with a freezing process for the unstable area. Installation of the cast-iron lining will be completed and shaft sinking will continue to about 3,300 feet. IMC is using a triple-deck sinking stage unit in the shaft sinking, a system that allows simultaneous activity at three levels—mucking, preparation of concrete forms and pouring of the concrete lining. **Haniel & Lueg** of Germany are directing the tubbing phase, while the shaft work is under contract to **Utah Construction & Mining Company**.

**BRITISH COLUMBIA**—Results from recent work in the adit on the 5,700-foot level at the **Clinton Creek** property of Cassiar Asbestos Corporation Ltd. indicate that the dimensions of the ore body and the grade and quality of the ore are comparable with that being mined currently at an average elevation of 6,000 feet. During the last fiscal year some 994 feet of drifting and crosscutting, and 3,224 feet of diamond drilling were com-

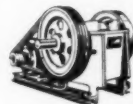
pleted. Sufficient tonnage has now been confirmed to justify a long-term stripping program. During the year, 471,561 tons of ore were mined and 1,949,282 tons of waste rock were removed in the stripping program. The company has installed a four-foot crusher and two screens between the primary crusher at the mine and the head of the tramline for partial concentration of ore, to improve the tramline capacity and storage at the mill by eliminating about 25 percent of the material handled. The mill treated 457,379 tons of ore during the year, for an average of 1,250 tons per calendar day. Research on the treatment of asbestos fibers and mill techniques is continuing and, where possible, improvements are incorporated in the mill from time to time. Investment in additions to the plant and equipment during the fiscal year was \$1,473,876.

**QUEBEC**—Sinking of the No. 5 internal production shaft at the Fourniere township gold mine of **East Malartic Mines Ltd.** is proceeding ahead of schedule with completion expected early this spring. The shaft was started on the 24th level and will extend to the 31st at a depth of 4,845 feet. After it is equipped, lateral development will start immediately with initial work planned for the 25th and 26th levels, and exploration at the 30th. The new shaft is located about 1,850 feet east and 200 feet south of the main No. 4 incline shaft. It will permit thorough investigation of the downward extension of the main ore body. Development work on another ore zone located last year east of the main mine operation continues to show encouraging results, although no tonnage calculations have been made.

**BRITISH COLUMBIA**—**Bralorne Pioneer Mines, Ltd.**, is converting the Bralorne flotation mill to cyanidation at a cost of about \$500,000. The work will be in three stages and is expected to result in higher gold recovery at lower cost, and increased production. Output has been about 16,000 tons monthly. An extensive mine exploration program also is being carried out, mainly in the 451 B and King mine areas. Drifting on the 451 B vein was suspended because the structure being followed did not show promise. Additional drilling has now located another structure which will be known as the 51 B foot-wall vein. Significant values have been secured over a strike length of 1,900 feet and a depth of over 750 feet, and crosscutting to this structure is now under way. Development of the 2932 vein will be resumed in the future from the Bralorne 31 level. The 38 level shaft station has been completed and the cross-cut from the Queen shaft to reach the 77 vein should be reached soon.

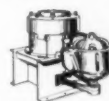
**ONTARIO**—An all-time record for mineral production in this province was forecast for the current fiscal year by James A. Maloney, Ontario's mines minister who predicted that the figure would exceed \$1,000,000,000. Tax revenue derived by the Province directly from the mining industry may reach \$19,000,000, he said. An extensive airborne geophysical survey to be undertaken jointly by the Ontario and Canadian governments will cover about 35,000 square miles in the extreme western part of the province, south of Red Lake. The \$150,000 project is a sequel to one completed last year when 60,000 square miles were flown and mapped.

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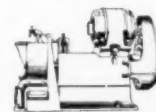
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## Europe

**EIRE**—Can-Erin Mines Ltd. is drilling at its **Mountain** copper mine and has completed three holes at the 400-foot level on the Commonmoor zone which is located some 500 feet north of the main East-West and North-South zones. One hole intersected 11.5 feet averaging 4.21 percent copper; another, 4.0 feet running 2.88 percent copper; and the third cut 3.0 feet averaging 2.18 percent copper. The Commonmoor zone was mined in early operations to about the 300-foot horizon and is known to extend intermittently over a strike length of about 2,200 feet. On the bottom 1,350-foot level of the mine near Allhies in County Cork drifting has been started on the East-West zone, west of the shaft. The company plans to extend the No. 2 crosscut on that level to establish stations for further drilling on both the North-South and East-West zones. Drilling is also planned at the **Caminches** mine, about 1,500 feet southwest of the Mountain, using the No. 2 crosscut.

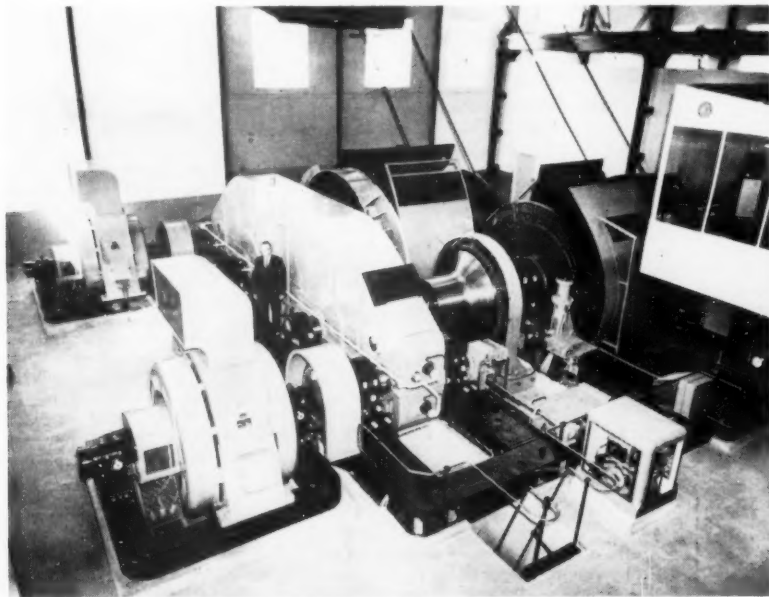
**RUSSIA**—Another diamond discovery, termed "incomparably richer" than the **Mir** deposit in the same Siberian region, has been reported by the **Soviet Yakut Diamond Trust**. The new find is the eleventh major deposit reportedly located within the last five years between the **Yenissey** and the **Lena** rivers on the central Siberian plateau. Most important is the **Mir** which is scheduled to reach full production capacity by 1965, and next is the **Udachnaya** pipe, which will not be fully developed until 1970. The new de-

posit, named **Aihal**, is in a quite inaccessible part of the Yakut Republic in the **Sokhsolookh** river valley, so development will probably be somewhat slow.

**FRANCE**—A \$2,000,000 company, **Seurobor/Societe Europeene du Bore**, has been formed to produce boric acid at a plant to be built at **Pierre Benite** near Lyons. Equal partners in the new firm are **American Potash & Chemical Company** of the United States and **Societe D. Electro-Chimie de Electro Metallurgie des Acieries Electriques de Ugine of France**. The new company's manufacturing activities will be managed by the **Ugine** firm which produces perborate and other boron derivatives in the Lyons area.

**NORWAY**—Iron ore production for 1960 is expected to total 1,600,000 tons while tonnage of aluminum is estimated at more than 160,000. Yearly output of aluminum is due to increase considerably, however, to about 240,000 tons while plans under discussion would more than double the latter figure. Ferrosilicon production in 1960 is expected to exceed 160,000 tons and to increase to 240,000 tons annually within four years. Below-average rainfall in north Norway and on the western coast in 1960 decreased waterpower and reduced capacity for production of aluminum and ferrosilicon.

**SPAIN**—The **Spanish Nuclear Energy Board** will purchase \$116,000 worth of diamond drills, portable compressors and other equipment from foreign sources. It is reported a **Stardrill** drilling rig will be purchased by the **Geological Service of the Ministry of Public Works**.



### Deep South African Mine Uses New Blair Hoist

The world's first Blair multi-rope, multi-layer drum hoist to be in full operation is shown here with its designer, **Robert Blair**, consulting mechanical engineer for **Anglo American Corporation of South Africa Ltd.** Mr. Blair was honored by **MINING WORLD-WORLD MINING** in 1960 for his outstanding technical contributions to the mining industry, which include the new multi-rope hoist. Installed at the No. 3 shaft of **President Brand Gold Mining Company Ltd.**, Orange Free State, Union of South Africa, the hoist has a hoisting depth of 5,200 feet. Operating details include: load capacity, 20,000 pounds; speed of shaft and skip, 3,000 feet per minute, and cable size, 1 1/8-inch diameter with a breaking load of 67.5 short tons. The unit is driven by two British General Electric a-c. motors of 1,800-horsepower each.

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# Oceania

**WESTERN AUSTRALIA**—Mitsui Mining and Smelting Company of Japan is acquiring a 20.5 percent interest in **Ravensthorpe Copper Mines N. L.**, which will aid the Australian firm in its expansion program to increase output of concentrate to over 10,000 tons yearly. By selling its concentrate in Japan, Ravensthorpe is ineligible for the copper bounty paid by the federal government. The bounty, payable only under certain defined profit conditions, has been extended for three years, and a new floor price of £A 305 per ton established.

**QUEENSLAND**—**Tableland Tin Dredging N. L.**, Mount Garnet, expects to treat above-average ground for the next few years. Because its dredge was out of action for several months after it capsized, the dredge treated only 1,948,000 cubic yards to recover 409 tons of concentrate during 1959-1960, while the previous year's figures were 3,958,303 yards and a yield of 706 tons of concentrate.

**FIJI ISLANDS**—The Fijian government will not extend its subsidy to **Emperor Mines Ltd.** because the prolonged disputes in the sugar industry have caused serious deterioration in the colony's finances. Negotiations will be continued, however, to find a solution to the problem of additional financing for the company to raise mine production to an economical level. Development in the last two years has indicated that the reserves are more extensive than origi-

nally estimated. According to N. E. Nilson, chief general manager, the operation could increase production and continue for another 25 years if aided by the government. Since operations began in 1935 the **Emperor, Loloma and Dolphin** mines have produced about 2,000,000 ounces of gold.

**REPUBLIC OF THE PHILIPPINES**—**Benguet Exploration Inc.** has put the flotation section of its new zinc mill into operation and a concentrate averaging about 50 percent zinc and 0.30 ounce of gold per ton is now being produced. The concentrate will be shipped to foreign plants for reduction to zinc metal and gold. The flotation section is to treat all the daily run-of-mine ore as well as some tailing previously collected. Last year was "exceedingly favorable" for Benguet, according to George T. Scholey, general manager of **Philex Mining Corporation**, which operates Benguet's properties, and the current year gives indication of bringing better operating results. Results of an intensified diamond drilling and development program last year were very satisfactory. Mill heads now average about 0.90 ounce of gold and 8 percent zinc, a grade that gives Benguet the distinction of being the highest grade gold mine in the Philippines. The mill is being expanded to increase its capacity from 35 to 50 tons per day.

**NEW SOUTH WALES**—Although lead and zinc production exceeds consumption, **Broken Hill South Ltd.** continues exploration for base metal deposits. The company has entered into an agreement giving a 51 percent interest in a joint venture with **Electrolytic Zinc**

**Company of Australasia Ltd. and North Broken Hill Ltd.** to prospect areas south of Broken Hill. Another agreement will give the company a 76 2/3 percent stake in a copper prospecting partnership with **Consolidated Zinc** in the Cobar district, which is getting renewed attention as a copper-producing area. Cobar district ores, which contain some gold, are generally clean sulphides, easy to mill and smelt.

**WESTERN AUSTRALIA**—Establishment of an integrated iron and steel industry at Kwinana and standardization of the Kwinana-Kalgoorlie railroad line are two of the projects expected to materialize as the result of the government's recent action to permit limited iron ore exports. **Broken Hill Pty. Company Ltd.**, which presently has a small rolling mill at Kwinana, has agreed to build the iron-steel facilities, since it now has rights to mine the Koolyanobbing ore deposits. Ore from this source will be shipped to eastern Australian states for smelting, since large-scale smelting in this state is impractical.

**SOUTH AUSTRALIA**—**Broken Hill Pty. Company Ltd.** will invest more than \$2,250,000 to establish an iron ore plant at Iron Knob which will treat 1,250,000 tons of ore per year to produce 600,000 tons of concentrate. Design work is already in progress, equipment is due to be ordered soon and the plant is expected to be in operation by June, 1962.

**REPUBLIC OF THE PHILIPPINES**—**Strategic Materials Corporation** of Buffalo, New York, has announced a licensing agreement for use of its Strategic-Udy process in the production of 25,000 tons a year of ferrochrome at a plant in the Philippines. The process combines a rotating kiln and a special electric furnace to process the ore.

**SOUTH AUSTRALIA**—An assessment of the formerly important Moonta copper field will be undertaken by **Western Mining Corporation Ltd.** in association with **Electrolytic, Refining and Smelting Company of Australia, Pty. Ltd.** The assessment will presumably include Wallaroo and other nearby areas. The first copper ore in Australia was mined at Kapunda near Moonta in 1844, the country's first copper smelter was located at Kanmantoo in the same area, and the country's first electrolytic copper refinery was built in 1891 at Wallaroo. These important producing areas have never been examined by modern methods and many mines closed because ore grades were too low for metallurgical processes known then. Ore is known to exist in many of the areas and although geological structures do not suggest deposits of magnitude, so little is known about them that reassessment is provoking interest.

**PAPUA**—After a year's field operations on Misima Island, **Pacific Island Mines Ltd.** considers this property to be a valuable asset. Three recent discoveries have increased gold bearing areas in the company leases to 20. The No. 1 adit along the No. 1 lode from the eastern side of Imgubinaina Creek is now 150 feet from the portal. Gold is mainly free and very finely divided. Widths and values across the lode will be tested soon by crosscuts at regular intervals. The company's pilot plant is expected to be in operation soon so that grade of deposits can be tested.

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## Latin America

### MISIPA Will Develop Sierra Grande Deposit in Argentina

An intensive scientific investigation scheduled to start soon will be the first phase in development of the Sierra Grande iron ore deposits of Argentina by a new company MISIPA (Minera Siderurgica Patagonica). Principal company in the combine is Ferrostahl A. G. of Essen, Germany.

Unofficial reports estimate the reserves of the Sierra Grande deposits in Rio Negro province to range between 30,000,000 and 200,000,000 tons, with ore averaging about 55 percent Fe.

Subsequent phases of the development will include a study of iron and steel making methods, establishment of a mining community, shipping facilities, power plants and other projects necessary for a full-scale operation.

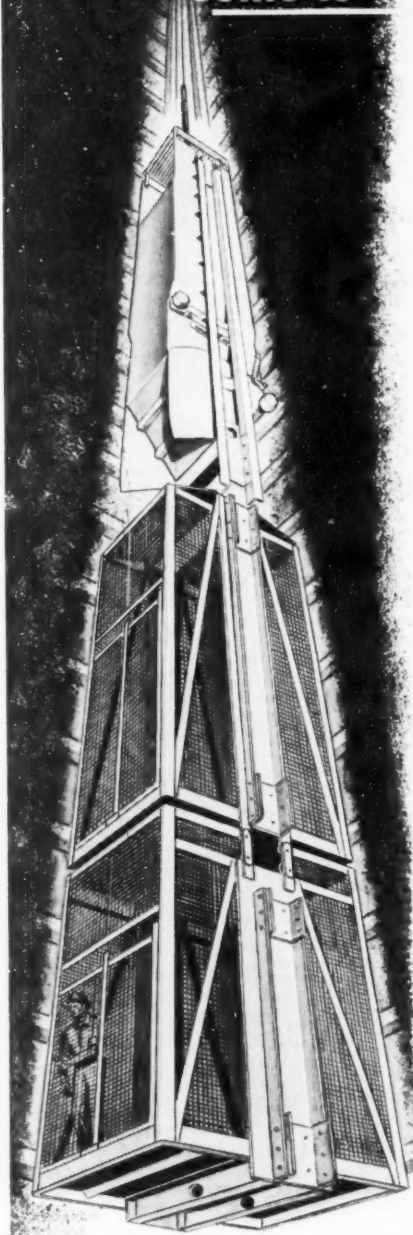
The new company will be capitalized at 2,500,000,000 Pesos (\$30,500,000) of which 500,000,000 Pesos has already been subscribed. A contract has been signed between MISIPA and the Argentine government agency, Fabricaciones Militares. In addition to Ferrostahl, which has numerous other South American interests, MISIPA is comprised of Minera Alumina S. A.; Acindar (Industrias Argentinas del Acero); SET, formed by Semaco S. A.; Escofisa S. A., and Trasmundo Company of the United States.

**BOLIVIA**—Bolivia Mining Corporation is to receive a \$10,000,000 loan from the United States for improvement and modernization of the nationalized company's ore concentration process. The loan, however, is contingent on a reorganization of the firm, reduction in personnel and use of improved techniques, so that Bolivian concentrates shipped abroad would be higher grade so shipping costs could be reduced. The loan offer was made after a Russian proposal to finance the construction of a tin smelter in Bolivia. (See MINING WORLD, January 1961, page 58.) A preliminary credit of \$4,000,000 has also been granted by the West German firm of Saltzgirter Maschinen Aktiengesellschaft, while William Harvey & Company Ltd. of England has advanced in sterling the equivalent of \$2,000,000 through its parent company Consolidated Tin Smelters Ltd. All the credits are part of a so-called \$40,000,000 triangular operation.

**MEXICO**—Japanese mining companies are showing increasing interest in mercury mining in Mexico. The Alicia mine in the Huahuaxtla district of Guerrero is being explored and developed by the Nomura Mining Company, Mitsubishi Kinzoku Kyogyo Kaibushiki Kaisha, and the Associated Metals and Minerals Company.

**COLOMBIA**—For the nine-month period ended in September, Pato Consolidated Gold Dredging Ltd. dredged 17,210,000 yards to recover 65,477 ounces of fine gold, as compared with 14,331,000 yards and 74,893 ounces for the same 1959 period. Realized value however was \$2,290,645, a decrease from the 1959 figure of \$2,437,011. Value per yard for the 1960 period was 13.31 cents; in 1959 it was 17.00 cents.

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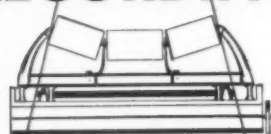
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## WHAT'S GOING ON . . . INTERNATIONAL

**BRAZIL**—Wah Chang Corporation of New York has provided \$592,279 worth of mining machinery and equipment to **Distribuidora e Exportadora de Minérios e Adubos (DEMA)** for mining and concentration of columbium ore at Barreiros, near Araxá, Minas Gerais. Wah Chang, which controls 5.0 per cent of the capital stock of the Brazilian firm, previously had furnished some \$60,000 worth of equipment. Wah Chang also operates in Brazil through a subsidiary, **Mineracao Wah Chang**, which mines and exports scheelite ore from northeastern Brazil.

**MEXICO**—The name of **The Cananea Consolidated Copper Company, S. A.** has been changed to **Compania Minera de Cananea, S. A. de C. V.** The firm is the operating subsidiary of **Greene Cananea Copper Company** and mines copper by both open pit and underground methods at properties at Cananea, Sonora, Mexico. **The Anaconda Company** holds more than 99 percent of the stock in Greene Cananea, which in turn owns a 99 percent interest in the Mexican firm.

**VENEZUELA**—An aluminum reduction plant in the Caroni region of southeastern Venezuela will be built by **Reynolds International, Inc.**, in cooperation with the Venezuelan government which will own a half-interest. Cost of the plant will exceed \$30,000,000 and its initial production capacity will be about 25,000 tons a year. Some of the bauxite for the plant will come from the Upata area in the state of Bolívar, about 25 miles south of the Orinoco River, where the ore occurs in an east-west belt parallel to the river. Some bauxite will probably be imported. About 80 percent of the initial output is expected to be for Venezuelan consumption, the rest exported until industrial demands of the country increase. Reynolds International, a subsidiary of **Reynolds Metal Company**, now has aluminum fabricating facilities in Venezuela which it plans to expand.

**PERU**—The contract for construction of a 26-mile extension to the Cuzco-Santa Ana Railways has been awarded to **Mitsubishi Shoji Kaisha Ltd.** of Japan. Overall investment in the project, which may open up a new lead-zinc district in south central Peru, will be \$5,600,000. Minerals and other raw materials may be accepted in repayment of up to 60 percent of the investment.

**HAITI**—Consolidated Halliwell Ltd. of Canada, through its subsidiary, **Sedren S.A.**, has intensified exploration on the northerly extension of its ore body in the Terre Neuve Valley. A second cross-sectional hole over a width of 30 feet averaged 12.02 percent copper, 0.131 ounce of gold and 2.18 ounces of silver per ton. The hole was drilled from the 1,330-foot adit. Although previous drilling was inconclusive, present results confirm the theory of a continuity of ore between the surface and the second level. The mill is treating about 850 tons a day, with recovery about 94 percent and the copper concentrate grade averaging 39.4 percent. First 2,500-ton shipment of concentrate was ready in December. Estimated reserves a year ago totalled 3,633,640 tons averaging 2.02 percent copper. Recent drilling has indicated an additional 300,000 tons of ore, it is estimated.

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## Asia

**CYPRUS**—During the last few months the **Esperanza Copper and Sulphur Company Ltd.** has maintained a production rate of about 1,000 tons of copper-gold-silver concentrate per month, despite encountering a portion of copper carbonate ore which could not be processed. Since this ore is not amenable to flotation, the company is considering a precipitation process if carbonate ore occurrences persist.

**TURKEY**—The largest loan ever made by the United States government for an industrial project overseas has been made to Turkey for construction of an integrated steel plant with a total cost of \$245,000,000. The Development Loan Fund credit of \$129,600,000 will be used to purchase United States services and materials for the project of **Eregli Iron and Steel Works**. A by-product coke plant, a blast furnace, basic oxygen furnace, rolling mills, and a power and steam plant will be included in the construction. Initial output is to be 470,000 tons per year with later expansion to about 1,200,000 tons.

**KOREA**—According to the Minister of Commerce, four state-operated concerns will be up for public sale early this year. The companies are **Korea Tungsten Mining Company**, the **Korea Heavy Industry Corporation**, the **Chosun Machinery Manufacturing Company**, and the **Korea Iron and Steel Manufacturing Company**.

**INDIA**—In keeping with the higher priority for mineral prospecting and development to meet domestic demands for metals in the Third Five Year plan, the government plans to increase production of aluminum, copper, zinc, and lead between 1961 and 1966. Tentative annual goals are aluminum to 82,500 tons; copper to 21,000 tons, zinc to 15,000 tons, and lead, 15,000 tons per year. Estimated demands are copper 85,000 to 170,000 tons; zinc, 85,000 to 187,000; lead, 35,000 to 65,000; tin 7,000 to 10,500; and aluminum 50,000 to 100,000 tons. At present the country produces only 8,000 tons of copper and 4,000 tons of lead per year, and no tin or zinc.

**JAPAN**—A copper deposit in Kotobe province, Akita Prefecture, has been located by **Mitsubishi Metal Mining Company Ltd.** after drilling of 60 holes during the last three years. Proven reserves are 700,000 metric tons and estimated reserves about 2,000,000 metric tons. The ore assays 2.5 percent Cu, 3.7 percent Pb, 17 percent Zn and 18 percent S. The company will invest 1,000,000,000 Yen in an extensive development program in the area this year. Initial step will be sinking of a 250-meter shaft, followed by construction of a 7,000-ton-per-month mill. When the operation is under way, copper concentrate (25 percent Cu) will be shipped to Mitsubishi's Osarizawa smelter and lead concentrate (50 percent Pb) and zinc (60 percent Zn) will go to the Akita smelter.

**MALAYA**—The estimated life of the undredged ground of **Southern Malayan Tin Dredging Ltd.**, which includes 400 acres of river reserve, is 10½ years, with five dredges in continuous operation. Some of the property contains extensive areas that could be reworked with a deep-

er-digging, large-capacity dredge. At the company's West Degong Road property there is a selected 520-acre area estimated to contain some 59,000,000 cubic yards of ground that can be worked for over 18 years by one dredge. If an adjacent area of 206 acres containing lower values is worked, another eight years of operation will be added.

**INDIA**—Production of lead-zinc ores in India in the first nine months of 1960 totalled some 127,000 metric tons, compared with 134,000 in the same period of 1959. Entire output was from the **Zawar** mines in Udaipur district of Rajasthan state. Recovery of lead and zinc concentrates amounted to 5,128 and 8,370 metric tons respectively in the period. Lead concentrate is sent to the lessee's smelter at Tundoo in Bihar state

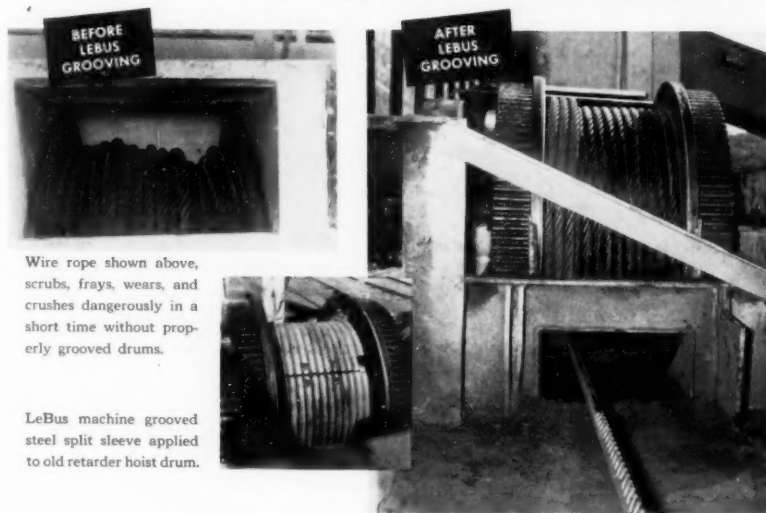
for extraction of lead and silver, while zinc concentrate is shipped to Japan since there is no zinc smelter in India.

**MALAYA**—**Pahang Consolidated Company Ltd.** reportedly has located a tin lode system outside its present concession area. Although some ore has been encountered, value of the discovery cannot be determined until further development is completed. If the results are favorable, the company presumably will undertake an output expansion program. Pahang is one of the few companies that mine tin by underground methods and increased its production considerably since tin restrictions were lifted. During the last fiscal year higher selling prices and reduction of operating costs per ton have improved the company's finances considerably.

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 1-15 KW Waukesha-Hesselman  
 1-30 KW Buda  
 1-75 KVA Caterpillar, D-13000  
 1-112½ KVA Caterpillar, D-17000  
 1-250 KVA Buda model 8D-CS-2505

**AIR TUGGER HOISTS**  
 1-Ingersoll-Rand Model DU  
 3-Ingersoll-Rand Model D6U  
 4-Ingersoll-Rand Model IH  
 14-Sullivan Model E-111  
 2-Ingersoll-Rand Model EJA  
 1-Ingersoll-Rand Model 10-H  
 4-Gardner-Denver Model MK  
 2-Joy "Turnbinair" Model F-113  
 1-Sullivan Model L-111  
 2-Ingersoll-Rand Model 10HR  
 1-Sullivan Model HA 3  
 3-Ingersoll-Rand Model HU

**AIR SLURHER HOISTS**  
 1-Ingersoll-Rand Model HNNIJ  
 1-Sullivan Model FF-211  
 1-Sullivan Model F-212

**ELECTRIC TUGGERS AND SLURHERS**  
 1-5 HP Sullivan, 2 drum slushers  
 1-5 HP Sullivan Tugger  
 2-7½ HP Sullivan tuggers  
 1-15 HP Ingersoll-Rand size 15NN-IG, 2 drum slushers  
 1-30 HP Joy Double Drum Slusher  
 1-60 HP Sullivan 3 Drum Slusher  
 1-10 HP Sullivan A-312 2 Drum Elec. Slusher  
 1-20 HP Sullivan AF-312 3 Drum Elec. Slusher

**BALL AND ROD MILLS**  
 1-4' x 4' Marcy Ball Mill  
 1-4' x 4½' Hirsch Ball Mill  
 1-64½ Marcy Ball Mill  
 1-8' x 22' Hardinge Conical Ball Mill

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1-1 cell Fagergren, 27" dia. type STD.  
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 1-1 cell Fagergren, 36" x 36" cell  
 1-2 cell Morse-Weinig, 37" x 37" cells  
 1-4 cell Morse-Weinig, #15, 24" x 24" cells  
 1-6 cell Stearns-Roger, 31" x 31" cells  
 1-4 cell Denver Sub-A, #21, 38" x 44" cells  
 1-6 cell Denver Sub-A, #21, 38" x 44" cells  
 1-6 cell Fagergren, 36" x 36" cells  
 1-2 cell Fagergren, 66" x 66" cells

### LABORATORY EQUIPMENT

6-8" New Morse Disc Pulverizers  
 1-8" Braun Model UA Pulverizer with 2 HP integrally built motor  
 1-Braun 8" Sieve-Shaker  
 4-Grieve-Hendry Electric Drying Ovens, Model MT  
 1-5" x 6" Denver Jaw Crusher  
 4-4" x 6" New Morse Jaw Crushers  
 6-2¼" x 3½" New Morse Jaw Crushers  
 2-12" Denver Lab Pressure Filters  
 2-12" Stearns-Roger Lab Pressure Filters  
 1-16" x 6" Lab Pub Mill  
 1-18" x 27" Revolving Dryer  
 2-14" x 19" Stearns-Roger Lab Ball Mills  
 2-2000 gram Denver Lab Flotation Cells

### WELDERS

2-300 AMP Lincoln Welders  
 1-300 AMP G.E. Electric Welder  
 1-300 AMP Hobart Welder gas engine driven  
 1-300 AMP P & H Welder gas engine driven  
 1-400 AMP Westinghouse Electric Welder  
 1-400 AMP Allis-Chalmers Transformer Type Welder

### DRYERS

1-8'2" x 60' Squier Rotary Dryer, tire and roller type, 30 HP Motor and gear drive

1-3' x 8' Morse New Rod Mill  
 1-5' x 10' Denver Ball Mill  
**CRUSHING ROLLS**  
 1-16" x 10" McFarlane  
 1-40" x 20" Cedar Rapids

### CRUSHERS

1-5" x 6" Denver Jaw Crusher  
 4-2¼" x 3½" New Morse Lab Crushers  
 3-4" x 6" New Morse Lab Crushers  
 1-5" x 6" New Morse Jaw Crusher  
 1-8" x 7½" Hendy Crusher  
 1-10" x 16" Gruendler Roller Bearing Jaw Crusher  
 1-10" x 20" Pacific Crusher  
 1-20" x 36" Diamond Roller Bearing, Steel Plate, Jaw Crusher  
 1-1'8" Traylor Type TY Gyrotory Crusher

### LOCOMOTIVES

1-1 Ton General Electric Battery Locomotive  
 1-1½ Ton Mancha Trammer  
 1-5 Ton Atlas Battery Locomotive  
 2-5 Ton General Electric Battery Locomotives  
 1-4 Ton Westinghouse Battery Locomotive  
 1-4 Ton General Electric Trolley Locomotive  
 1-4 Ton General Electric Battery Locomotive  
 1-6 Ton Goodman Trolley Locomotive  
 2-6 Ton Jeffrey Trolley Locomotives  
 2-6 Ton General Electric Battery Locomotives  
 1-7 Ton Atlas Battery Locomotive  
 2-8 Ton General Electric Battery Locomotives  
 3-8 Ton Ironton Battery Locomotives  
 1-9 Ton Whitcomb Battery Locomotive  
 4-10 Ton Atlas Battery Locomotives  
 2-10 Ton Jeffrey Trolley Locomotives  
 1-13 Ton Jeffrey Trolley Locomotive  
 1-13 Ton Goodman Trolley Locomotive  
 1-15 Ton Jeffrey Trolley Locomotive

### FILTERS

1-3' x 4' Oliver Drum Filter  
 1-4' x 2' Morse Drum Filter  
 1-4' x 8' Eimco Drum Filter  
 1-6' x 3' Dorrco Internal Type Filter  
 1-6' x 2' disc Oliver Leaf Filter  
 1-6' x 5' disc Morse Leaf Filter

## MINING SPECIALS FOR SPRING

USED ONLY 2 YEARS  
 EXCELLENT SCREENING  
 & CRUSHING EQUIPMENT

### JAW CRUSHERS

2-30" x 42" Pioneer Jaw Crushers, roller bearing, 125 HP, Elliot TEFC Motors, 440 V. with Clark switch.

### SCREENS

3-6' x 14' Hewitt-Robins, MH-11 Vibrex heavy duty scalping screens, 1 deck, 20 HP, TEFC Motors, 440 V.

### FEEDERS

2-60" wide x 16'3" Pioneer Oro-Feeders, heavy duty manganese pans, 20 HP, U.S. Varidrive motors, 440 V.

### BELT CONVEYORS

2-48" x 22' Belt Conveyors, 5 HP, Schrock motorized head pulley, 440 V.  
 1-60" x 30' Hewitt-Robins Belt Conveyor, 40 HP, Elliot Motor TEFC 440 V.

### AGITATORS

2-4' x 5' Wemco, wood tank, 1½ HP.

### CONVEYORS

1-30" x 1600' Jeffrey Model 52H, Steel Frames  
 1-30" x 128' Stephens-Adamson, Complete with rail car loading station  
 1-60" x 150' Truss Frame, 100 HP.  
 1-42" x 1250' Link-Belt, Steel frame, 2-100 HP motors  
 1-36" x 645' Link Belt steel frame, 2-100 HP motors  
 1-42" x 870' Link Belt Steel frame with mobile stacker

### COMPRESSORS

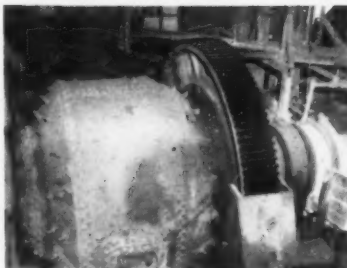
1-2500 cfm Sullivan, Class WN4, 2200 V.  
 1-1328 cfm Joy, WN114, 300 H.P., 2300 V. Exc.  
 1-Joy WGN, 12 x 9, Less Motor  
 1-500 cfm Inj. Rand XRB, 100 HP, 440 V.

### CRUSHERS

1-15 x 24 Traylor Blake Type, 40 H.P., 440 V.  
 1-2¼ x 3 Braun Chipmunk, 2 H.P.  
 1-10" x 30" Pacific Jaw, 40 H.P.  
 1-15" x 36" Universal, 50 H.P., 440 V.  
 1-4' Symons Standard Cone, 75 H.P.  
 1-4' Symons Std. Cone, 125 H.P., 440 V.

### FEEDERS

10-Type 2DH Jeffrey Vibrating, 8 x 36" Pans  
 4-Type 4 Jeffrey Vibrating  
 1-F45A Syntron Vibrating, 30" x 60" with controls



7' x 36' Hardinge Ball Mill

1-4' x 8' Jeffrey Vibrating Type 5, 440 V.  
 1-3' x 6' Jeffrey Traylor Grizzly Pan, 440 V.  
 1-30" x 13' Belt Ore, like new, 1½ HP.  
 1-36" x 15' Link Belt, apron, 3 HP.

### HOISTS, MINE SHAFT

1-10 H.P. Cœur d'Alene, Single Drum  
 1-50 H.P. Superior Ligerwood, Tandem Drums, 220 V.  
 1-75 H.P. Puget Sound Single Drum, Post Brakes  
 1-100 H.P. Denver Engineering Single Drum, 100 H.P., 440 V.  
 1-150 H.P. Vulcan Denver Single Drum, New  
 1-600 H.P. Vulcan Wilkes Barre, 2 drum, 2300 V.  
 1-675 H.P. Vulcan Wilkes Barre, 2 drum, 2300 V.  
 1-165 H.P. Denver Eng. Works, 2 drum, 440 V.

### HOISTS, TUGGERS & SLUSHERS

2-BFA 312 Joy 3 drum, 440 V.  
 1-BF 312 Joy, 3 drum, 20 H.P., 440 V.  
 1-FF311 Joy, 3 drum, 10 H.P., 440 V.  
 1-FF211 Joy, 2 drum, 10 H.P., 440 V.  
 2-30 NM3D Inj. Rand, 2 drum, 30 H.P., 440 V.  
 1-20 NM2C Inj. Rand, 2 drum, 20 H.P., 440 V.  
 1-CA 311 Sullivan, 3 drum, 50 H.P., 440 V.  
 1-CF 211 Sullivan, 2 drum, 50 H.P., 440 V.  
 10-HB Gardner Denver, 1 drum, Air  
 8-L-111 Joy, 1 drum, Air  
 10-ASNNOH Ingersoll Rand 3 drum, air.

### JIGS

1-16" x 24" Denver duplex, 1½ HP.  
 1-12" x 18" Denver duplex  
 1-26" x 26" Bendalori Simplex  
 11-42" x 42" Yuba model M8 4 cell unit  
 1-42" x 42" Yuba, model M8 2 cell unit

### LOCOMOTIVES

6-1½ Ton Mancha battery, 18"-24" ga. Complete  
 1-1½ Ton Atlas, Type J, 24" ga. w/chargr.  
 1-3½ Ton Mancha Type AN, Battery, 18" ga.  
 1-4 Ton Mancha, Titan, A, battery, 24" ga.  
 1-6 Ton Mancha, Std. AN, battery, 24" ga.  
 1-7 Ton Plymouth diesel, w/scrubber, 18" ga.  
 1-8 Ton Plymouth diesel, w/scrubber, 24" ga.

### MILLS

5-8' x 9' Traylor Ball Mills, 250 H.P. motor  
 3-5' x 14' Marcy Ball Mills, 100 H.P.  
 1-6' x 16' Hardinge Conical, 50 H.P.  
 1-7' x 36' Hardinge Conical, 100 H.P.  
 1-7' x 22' Hardinge Conical, 75 H.P.  
 1-7' x 5' Allis Chalmers, 150 H.P.  
 1-7' x 48' Hardinge Conical, 150 H.P. motor  
 1-5 x 10 Marcy Ball Mill, 100 H.P.

### MUCKING MACHINES

2-128 Eimco Rocker Shovel, Late Serial, 18"-24" ga.  
 5-GD9 Gardner-Denver 18" ga.  
 1-HL3 Sullivan, 18" ga. bargain  
 2-21 Eimco Rocker Shovel, 25" ga.

### SCREENS

2-6 x 12 Allis Chalmers single deck lowhead.  
 1-3 x 6 Allis Chalmers single deck aerovibe  
 1-3 x 7 Link Belt model PD, single deck.  
 1-4' x 9' Deister Plato, 1 deck, 7½ H.P.  
 3-4' x 12' Tyler Ty-Rock, F600  
 1-4' x 10' Tyler Hummer, 1 deck  
 1-4' x 8' Symons Rod Deck

### SHOVELS

1-7 yd. Bucyrus Erie, 170 B, electric  
 1-3½ yd. Marion 111M, with Dragline  
 1-20B Bucyrus Erie Shovel with 40' Dragline  
 1-54B Bucyrus Erie with dragline

### THICKENERS

1-15' x 8' Denver Rake Thickener Less tank  
 1-120' Dorr Traction Type I-C, 5 H.P.

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FAN: Jeffrey Aerodyne, 7' dia., 200,000 CFM, 250 HP motor, 1170 RPM, 16 groove pulley, 2300 volt, 3 phase, 60 cycle, complete with control. New 1958, used one year, condition like new.

SCREEN: Leaky heavy duty, type D, single deck, for wet process. New condition.

CONCENTRATING TABLE: Deister #6 super duty. New condition.

JAW CRUSHERS: A-C 40 x 42" complete with or without motor and drive, also with or without Telsmith heavy duty Feeder 42" x 14 1/2" with speed reducer and drive. A-C 18 x 30" sectionalized for underground use.

GYRATORY CRUSHER: Telsmith 16-B, all steel.

ROLL CRUSHER: Pioneer size 54 x 24", roller bearing equipped, used on one job.

AIR COMPRESSOR: I-R class PRE2, 4500 CFM, 787 HP synchronous motor, 3 phase, 60 cycle, 2200 V, 150 RPM.

SUBSTATION: One G. E. 3750 KVA consisting of three 1250 KVA, 66000/2400/4150Y with two G. E. 630 amp., 2300 volt ATF switch boxes, all accessories, including cyclone fence. New 1957. Condition like new.

HOISTS: One double drum 53" x 36", 75 HP, 550 V, 7/8" rope  
 One double drum 42" x 36", 100 HP, 550 V, 7/8" rope  
 One double drum 72" x 31", 200 HP, 2200 V, 1 1/4" rope  
 One double drum 48" x 36", 200 HP, 2200 V, 7/8" rope  
 One double drum 72" x 48", 250 HP, 550 V, 1 1/4" rope  
 One double drum 72" x 54", 300 HP, 2200 V, 1 1/4" rope  
 One double drum 72" x 64", 400 HP, 2200 V, 1 1/4" rope  
 One double drum 72" x 54", 400 HP, 2200 V, 1 1/4" rope  
 One 10' x 10" double clutched drums, 1250 HP, 1 1/2" rope, 1200 FPM  
 One single drum 60" x 60", 100 HP, 2200 V, 1" rope  
 One single drum 84" x 63", 150 HP, 2200 V, 1 3/8" rope  
 One single drum 84" x 63", 300 HP, 2200 V, 2 1/2" rope  
 One single drum 84" x 63", 450 HP, 2200 V, 2 1/2" rope  
 One single drum 90" x 72", 700 H.P., 1 3/8" rope.  
 Other hoists 100-1500 HP for shaft or slope

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16' Gayco Air Separator w/ Motor  
 2-5'x8' Kennedy Van Saun Air Swept Ball Tube Mills with disc feeders, fans, piping  
 4 1/2' x 9' KVS Air Swept Ball Mill  
 2 Wemco 2M-HMS Plants  
 5' x 5', 6' x 4' & 6' x 9' Traylor Ball Mills  
 No. 56 and 7' x 15' Marcy Ball Mills  
 10' x 48" & 5' x 22" Hardinge Ball Mills  
 4' x 11" & 7' x 15' Marcy Rod Mills  
 12" x 26", 14" x 28", 18" x 36", 30" x 36", 48" x 60", 66" x 84" & 48" x 72" Jaw Crushers  
 8" x 10" Denver Jaw Crushers, rebuilt  
 24" x 14" & 42" x 16" Type B A.C. Roll Crushers  
 5 1/2' Symons Std. Cone Crusher  
 7' Symons Short Head Cone Crusher  
 10-No. 6s Wilfley Concentrating Tables  
 78" x 36" 6' Akins Duplex Spiral Classifier  
 8' x 37' x 19' Dorr Bow Rake Classifier  
 6' x 30" & 8' x 60" Rotary Dryers  
 3' x 30", 7' x 120" & 9' x 162" Allis Chalmers Rotary Kilns  
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 Designed and Built

## GOLDMILL

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Gold Recovery 97%  
 Silver Recovery 92%  
 3/4 of Gold as Bullion  
 1/4 of gold in \$1000. per ton concentrates  
 MILLING COSTS \$1.15 per ton

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**MARYSVILLE, MONTANA**  
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 Mucker Eimco 12-B 18 24" ga. Late serial  
 Screen 48x12 Cedar Rpds. 2-deck horizontal  
 Jig 24x36 Denver Mineral duplex  
 Samplers 60 & 28" Vexin standard type  
 Feeder 42"x12 ft. A-W-Lima steel apron  
 Crusher 20x36 Austin-Western rlr-brg  
 Crusher 15x30 Buchanan Blake type  
 Crusher 10x20 Denver Eq. rlr-brg  
 Crushers 3 Kue-Ken 18" Gyracone  
 Mill 6x4 1/2 Straub grate discharge  
 Mill 5x10 Allis-Ch w/new liners  
 Mill 5x6 Colo. l. Wks. over-fl. dis.  
 Mill 5x4 Eimco w/ball charge  
 Mill 4x10 Hardinge periph. end dis.  
 Flotation 6-Cell 56x56 Wemco Fags v-belt-dr  
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 Filter 3-Leaf 6 ft. American w/vac. eq.  
 Thickener 28x10 Dorr low-head; steel tank  
 Rolls 42x16 Allis-Ch. w/new parts  
 Rolls Triple 30x18 Pioneer like new  
 Rolls 30x18 Cedar Rapids

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 2-National 10' x 78 dryers, 3/4" shell  
 2-Hardinge 8'-8" x 70' dryers, 9/16" welded  
 2-Davenport 8' x 60' dryers, 7/16" welded  
 2-8' x 56' rotary kilns, 1/2" welded  
 3-Stearns-Roger 8' x 40' dryers, 1/2"  
 1-7'-6" x 100' rotary kiln, 1/2" shell  
 1-7' x 6' x 100' rotary kiln, 1/2" shell  
 2-Bonnet 7' x 60' dryers, 9/16" shell  
 2-Vulcan 7' x 54' dryers, 1/2" shell  
 1-Bonnet 6' x 52' dryer, 5/16" shell  
 2-4'-9" x 32' rotary dryers, 3/8" shell

### MILLS - PULVERIZERS - CRUSHERS

1-Symons 2' standard cone crusher, 30 HP.  
 1-Farrel 36" x 15" jaw crusher  
 1-Buchanan 24" x 13" jaw crusher, 50 HP.  
 1-Denver 5' x 10' rod mill, 150 HP.  
 1-Allis-Chalmers 5' x 5' ball mill, 75 HP.  
 1-Raymond 50", 5-roller hi-side mill  
 3-Allis-Chalmers 5' x 22" ball-tube mills

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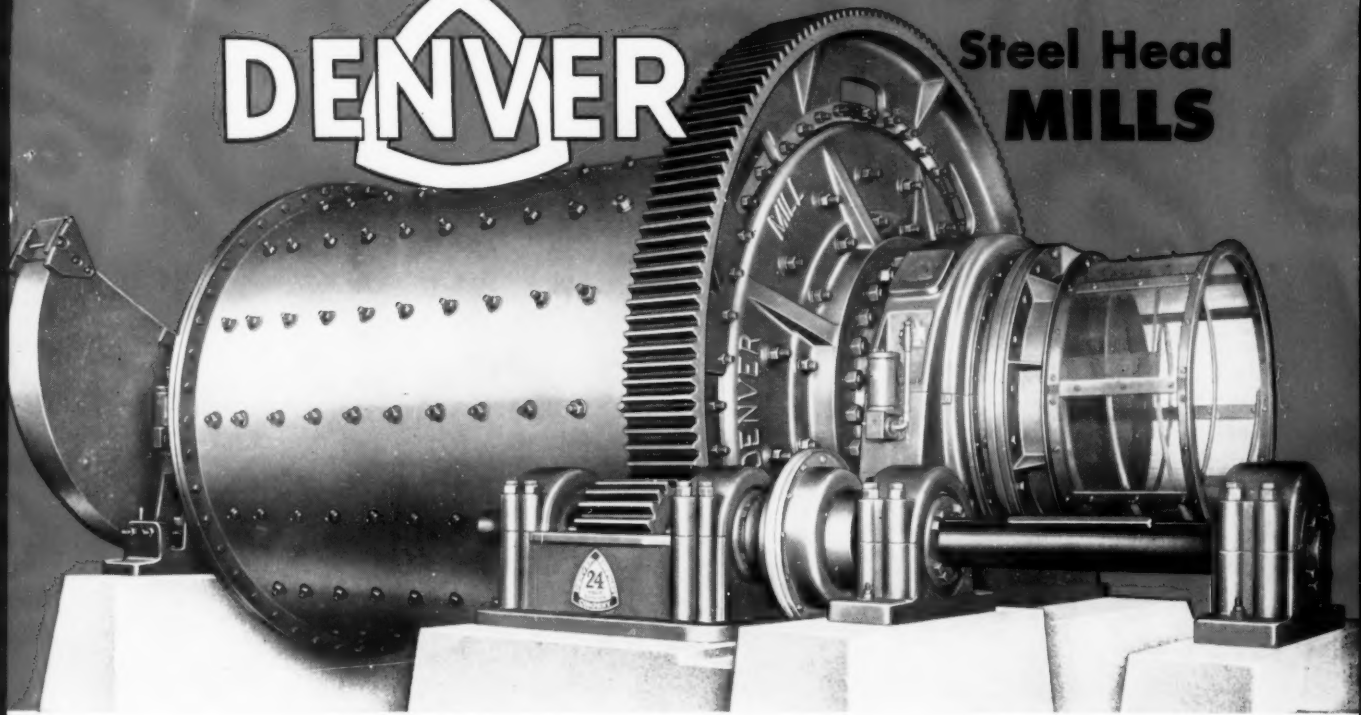
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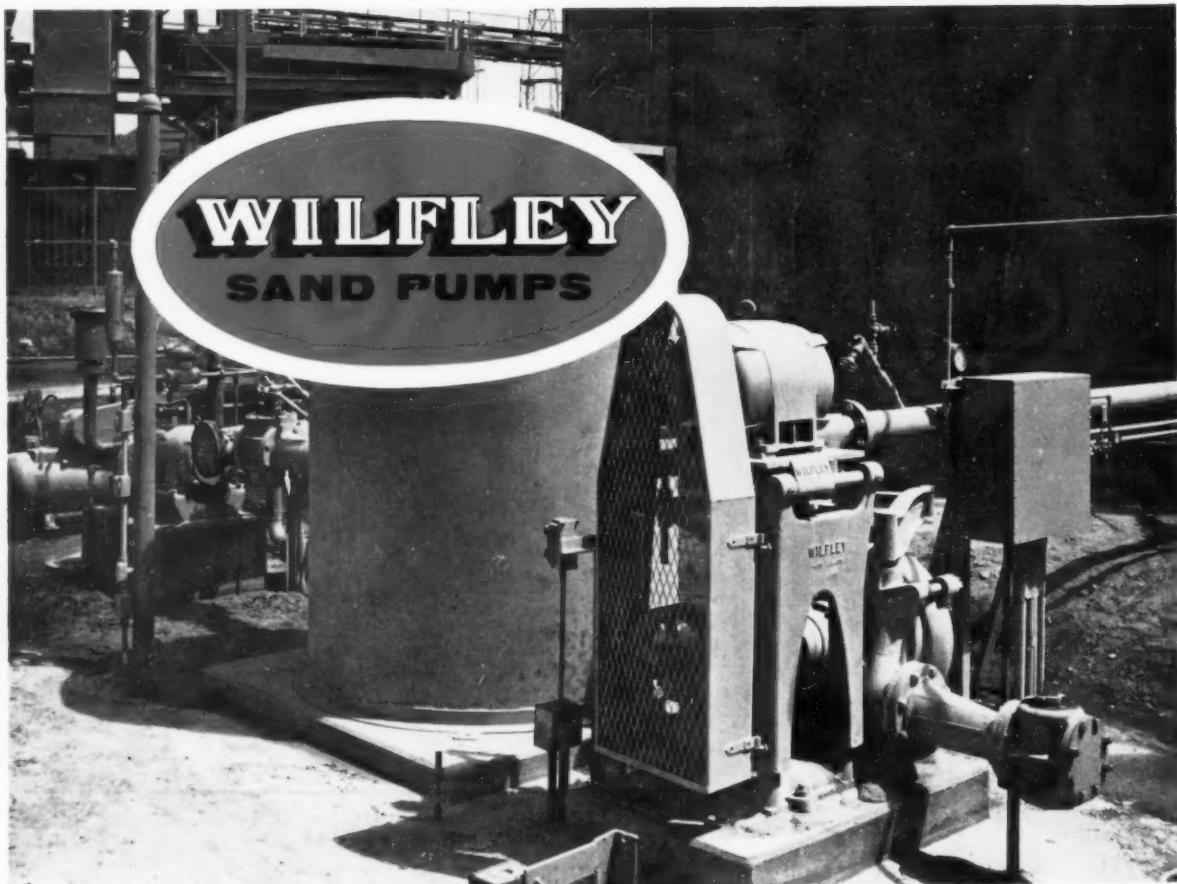
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